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ABSTRACT

The present investigation involves 600 personality questionnaire items. The 300 Guilford items comprise 78 marker clusters for 15 Guilford factors; the 300 Cattell items represent marker items for 17 Cattell factors. The study involved two major analyses. In the first, the 600 x 600 matrix was factor analyzed by the Principal Factor Method, extracting 18 factors for one rotation, and 15 factors for a second. The second analysis involved two steps. Step one consisted of separate factor analyses and rotations of the 300 x 300 item Guilford and Cattell matrices, in each case including factor loadings for the "other" 300 items. Step two was designed to determine the factors in each matrix after removing the effects of the factor loadings of the "other" set of items in that matrix. All rotations were made by both Varimax and Promax computer programs. Coefficients of conguence were computed between all rotated factors in all analyses. The correlations among items and the factored and rotated results demonstrated, beyond question, that analysis at the item level is highly destructive to the factors previously assembled with inadequate concern for their loadings in large matrices in which a wide range of factors is known to exist. If the results are accepted, the indications for reclassification of at least 400 of the 600 items included in the study are obvious. (IM)

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S. B. SELLS, ROBERT G. DEMAREE, AND DONALD P. WILL, JR.
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CG 003 323

CG 003 323

TABLE OF CONTENTS

Page

ACKNOWLEDGMENTS iv

LIST OF TABLES vii

LIST OF APPENDICES xi

INTRODUCTION 1

THE GUILFORD AND CATTELL PERSONALITY TRAIT SYSTEMS 6

GENERAL APPROACHES 6

ITEM POOLS 9

Item Structure 9

Item Density 12

Item Content 15

HYPOTHESES CONCERNING RELATIONSHIPS 22

SPECIFICATION OF THE PRESENT INVESTIGATION 25

PROCEDURES 28

SELECTION OF FACTORS AND ITEM FACTOR MARKERS 28

ITEM AND TEST FORMATS 30

SUBJECT SAMPLE 31

ADMINISTRATION OF EXPERIMENTAL BOOKLETS 33

SCORING 35

ANALYSIS OF DATA 36

Computational Decisions 36

Page
Steps in the Analysis.. 40
RESULTS.. 42
CORRELATION MATRICES.. 42
FACTOR EXTRACTION AND ROTATION 45
Principal Factor Analysis of the Total Matrix 45
Principal Factor Analysis of the Two Source Matrices 54
Principal Factor Analysis of the Residual Source Matrices 59
FACTOR CONGRUENCES.. 66
Congruence Among Factors Within Matrices......................... 66
Congruence Among Factors Across Matrices......................... 67
VARIANCE DISTRIBUTION OF THE TOTAL MATRIX...................... 74
FACTOR IDENTIFICATION... 78
Correlation of Empirical Factors With Source Factors............... 78
Examination of Items With Salient Loadings......................... 84
RELATIONS OF SOURCE FACTORS TO EMPIRICAL FACTORS.......... 170
Guilford Source Factors... 170
Cattell Source Factors... 172
CONCLUDING DISCUSSION AND SUMMARY 179
REFERENCES... 186
APPENDICES... 188

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LIST OF TABLES

Table	Page
1. Guilford's Matrix of Temperament Factors....................	8
2. Distributions of Age and AFQT Score for Final Sample.........	34
3. Percentage Distribution of Correlation Coefficients in the Three Matrices, Showing Per Cent by Range of Magnitude...........	38
4. Distributions Showing the Frequencies of Guilford and Cattell Items with Indicated Numbers of Correlations Exceeding .09 Within and Across Their Respective Source Sets..............	44
5. *Unrotated Factor Results for the 600 x 600 Matrix:* Data Relevant to the Number of Factors Entered into Rotation.......	46
6. Frequency Distributions of Original and Residual Correlation Coefficients in the 600 x 600 Matrix after Extraction of 15, 18, and 23 Factors..	48
7. Distribution of the Communalities of the Guilford and Cattell Variables for 15, 18, and 23 Factors from the 600 x 600 Matrix.	49
8. Variance for Rotated Factors Extracted from the 600-Variable Matrix..	50
9. Coefficients of Congruence between the Correspondingly Numbered Varimax and Promax Factors in the 18-Factor and the 15-Factor Rotations..	51
10. Coefficients of Congruence between Varimax and Promax Factors in the 18-Variable and 15-Variable Rotations................	53
11. Unrotated Factor Results for the Cattell 300 x 300 Matrix and Residualized Guilford Matrix: Data Relevant to the Cessation of Factoring...	55
12. Unrotated Factor Results for the Guilford 300 x 300 Matrix and Residualized Cattell Matrix: Data Relevant to the Cessation of Factoring..	56
13. Distribution of the Communalities of the Guilford and Cattell Variables for the 12 Factors from the Guilford Matrix and the 11 Factors from the Cattell Matrix...........................	57

Table Page

14. Variances for Varimax and Promax Rotations of 12 Guilford and 11 Cattell Factors, Showing Proportions, Attributed to Guilford and Cattell Items, for Each 58

15. Frequency Distributions of Original Correlations and Residuals After Extraction of 12 Factors from Guilford Matrix and 11 Factors from Cattell Matrix 60

16. Coefficients of Congruence Between the Correspondingly Numbered Varimax and Promax Factors in the Guilford 12-Factor and Cattell 11-Factor Rotations 61

17. Factor Variances for Varimax and Promax Rotations of 8 Supplementary Guilford Factors and 7 Supplementary Cattell Factors 63

18. Frequency Distributions of Residuals before and after Extraction of 8 Supplementary Guilford Factors and 7 Supplementary Cattell Factors from the Residual Source Matrices 64

19. Coefficients of Congruence Between the Corresponding Numbered Varimax and Promax Factors in the Supplementary Guilford and Cattell Factor Rotations 65

20. Factors Congruent With the 19 Total Matrix Promax Factors 68

21. Factors Congruent With the 12 Guilford Promax Factors 69

22. Factors Congruent With the 11 Cattell Promax Factors 70

23. Distribution of Variance Among the 18 Promax Factors from the Total Matrix Among Guilford and Cattell Sources 75

24. Distribution of Variance Accounted for By 18 Promax Factors (Total Matrix) Among Factors Common to the Guilford and Cattell Source Items or Unique to One or the Other Source 77

25. Salient Correlations Between Empirical and Source Factors Based on Varimax Factors Obtained Independently from the Guilford and Cattell Source Matrices: Correlations for Congruent Factors Common to Both Sources 79

26. Salient Correlations Between Empirical and Source Factors Based on Varimax Factors Obtained Independently from the Guilford and Cattell Source Matrices: Correlations for Factors Identified as Predominantly Contributed By Guilford Items 80

Table Page

27. Salient Correlations Between Empirical and Source Factors Based on Varimax Factors Obtained Independently from the Guilford and Cattell Source Matrices: Correlations for Factors Identified as Predominantly Contributed By Cattell Items........ 81

28. Distributions of Salient Items on Factor T_1 G_1 C_1 By Source Factor, Comparing Distribution for First 50 Items (Loading Range, .79 to .39) With That for the Next 37 Items (Loading Range, .39 to .30).. 89

29. Distributions of Salient Items on Factor T_2 G_2 C_2 By Source Factor Comparing Distribution for First 43 Items (Loading Range, .67 to .30) With that for the Next 30 Items (Loading Range, .30 to .21). 91

30. Distributions of Salient Items on Factor T_4 G_4 C_3 By Source Factor, Comparing Distribution for First 31 Items (Loading Range, .78 to .30) With That for the Next 36 Items (Loading Range, .29 to .20). 95

31. Comparison of Factors T_2 and T_{15} With Respect to Common Salient Items and Factor Loadings of Guilford R and Cattell F Markers.. 139

32. Camparison of Factor Loadings on T_4 and T_{18} of Fifteen Items Salient of T_{18}.. 144

33. Summary of Numbers of Salient Numbers on 18 Promax Factors, By Source Factor.. 146

34. Summary of Numbers of Marker Items With Principle Factor Loadings on the 18 Promax Factors, By Source Factor.......... 147

35. Provisional Titles Assigned to 18 Promax Factors and Summaries of Factor Variances, Numbers of Salient Items and Numbers of Marker Items, By Source.................................. 148

LIST OF APPENDICES

Appendix | Page

1. Copies of Test Booklets and Answer Sheets.................. 188

2. Analysis and Listing of Items by Variable Number, Scoring Key, Test Number, Source List Number, Source Factor, and Cluster.. 189

3. Abbreviated Factor Matrix, 18-Factor Promax Rotation......... 239

4. Abbreviated Factor Matrix, 12-Factor Promax Rotation......... 254

5. Abbreviated Factor Matrix, 11-Factor Promax Rotation......... 267

6. Intercorrelations Among Promax Factors..................... 280

7. Cluster Correlation Coefficients Estimating Loadings of Source Factors on Empirical Varimax Factors for Guilford and Cattell Matrices..................................... 283

8. Percentages of Elements Lying Within the Hyperplane (± 10) for Each Factor Matrix...................................... 287

A Taxonomic Investigation of Personality. Conjoint Factor Structure of Guilford and Cattell Trait Markers

S. B. Sells, R. G. Demaree, and Donald P. Will, Jr.

INTRODUCTION

Factor analytic research in the personality domain has as yet failed to produce a set of traits reflecting the consensual agreement and empirical convergence that exists in the ability domain, particularly in the subdomain of "primary mental abilities." Perhaps the most extensive and systematic developments are those of Guilford and his associates at the University of Southern California and of Cattell and his associates at the University of Illinois. Nevertheless, despite areas of apparent agreement, the trait systems represented by these two eminent investigators are overall so disparate as to raise questions concerning the rationality of the research methods used.

It is well-known that variations in factor analytic results may be expected as functions of the item pools used, population samples, methods of factoring and of factor rotation, as well as of computational decisions such as types of correlation coefficients used, selection of diagonal elements in the correlation matrices, and the like. However, one might expect such variations to be minor in relation to the classification of a wide range of items administered to comparable population samples.

A detailed examination was made of the data and factor descriptions reported by Guilford and Cattell by the senior author (Sells, 1962). This exhaustive review led to the conclusion that no systematic relation between the two systems could be found. Although the differences noted are undoubtedly attributable to variations in item and subject samples and analytic methods, it is not possible to assign weights to specific sources of variation or to achieve an acceptable rapprochement on the basis of perusal of the source reports. Prior to the present investigation, no comprehensive, systematic data representing markers for both trait systems on a common population sample have been available.

A preliminary effort to analyze Guilford and Cattell factor markers in a conjoint matrix was undertaken by Gibbons (1966) as a doctoral dissertation under Guilford. Gibbons' data involved 424 items representing 14 Cattell factors and 15 Guilford factors. His factor analysis was based on 69 variables, representing the 424 items, which were constructed out of non-overlapping clusters of five or six items with homogeneous content, selected as markers for their respective factors. The sample consisted of 302 undergraduate students, approximately evenly divided by sex class. Gibbons' data were subsequently reanalyzed by Cattell and Gibbons (1968) following an elaborate procedure designed by Cattell, with the result that all 14 Cattell factors were confirmed both by identifying markers and by second-order structure; three Guilford factors were clearly aligned with Cattell factors (M - Masculinity with I - Harria, N - Nervousness with O - Guilt Proneness, and S - Sociability with H - Parmia), four (E - Emotional Stability, G - General Activity, R - Restraint, and T - Thoughtfulness) split their loadings and were judged to be "test homogeneous-factor heterogeneous," while five others (C - Cycloid Disposition, D - Depression, F - Friendliness, O - Objectivity, and P - Personal Relations, Cooperativeness) were regarded as expressions of O - Guilt Proneness.

Cattell and Gibbons concluded that the 14 Cattell factors and 15 Guilford factors have eight dimensions in common, related to the Cattell factors A - Cyclothymia, H - Parmia, I - Harria, M - Autia, O - Guilt Proneness, Q_2 - Group Dependence, and Q_4 - Ergic Tension. Six Cattell dimensions, C - Ego Strength, E - Dominance, F - Surgency, G - Superego Strength, L - Protension, and Q_3 - Self Concept Control, were concluded to be outside the Guilford domain, while one Guilford factor, AA - Artistic Interest, was thought to be outside the Cattell domain.

Although these results, favoring the reasonableness of the Cattell structure, were considered reasonably effective, a number of limitations, but principally inadequate sampling of persons and items, were cited and the need for further, more extensive, systematic investigation was recognized.

Gibbons' study, initiated under Guilford, but published with Cattell, does indeed leave many questions unanswered. Since these are related to the design of the present investigation, they are discussed below. Apart from factoring and related methodological issues, these include the most careful scrutiny of item content, format, and similarity, which can best be accomplished by investigators not identified with the sources.

The present investigation involves 600 personality questionnaire items administered to 2550 airmen at Lackland Air Force Base, Texas, in 1966. The personality items were selected by the Principal Investigator after advice and consultation with Professor Guilford and Professor Cattell. The 300 Guilford items comprise 78 marker clusters for 15 Guilford factors and the 300 Cattell items represent marker items for 17 Cattell factors. Both are discussed below.

The general strategy of the study involved two major analys s. In the first analyses, the 600 x 600 matrix was factor analyzed by the Principal Factor Method, extracting 18 factors for one rotation and 15 factors for a second rotation. The second analysis involved two steps. Step 1 consisted of separate factor analyses and rotations of the 300 x 300 item Guilford and Cattell matrices, in each case including factor loadings for the "other" 300 items, estimated by the Dwyer extension method. Step 2 was designed to determine the factors in each matrix after removing the effects of the factor loadings of the "other" set of items in that matrix. This step required residualizing each 300 item matrix, factoring, and then rotating the residual factors. All rotations were made by both Varimax and Promax computer programs. Coefficients of congruence were finally computed between all rotated factors in all analyses.

The execution of necessary computations on these large matrices presented new programming and decision problems not previously encountered in this area of research and encountered serious delays. Indeed, it is believed that the 600 matrix is the one of the largest ever factor analyzed to date. Early efforts to use an "economical" approach by means of a program developed by Findikyan, based on the Overall and Porterfield (1963) Powered Vector Method proved unsatisfactory because this method was inappropriate for matrices with predominantly low correlations of the magnitudes characteristic among personality items, such as those involved in this study. A preliminary analysis was made, using a modification of the method suggested by Dr. Overall. However, it was then decided to start over and use the Principal Factor Method. The sheer magnitude of the computations involved tested the limits of the computers used as well as the ingenuity of the programmers and computer scientists who contributed to the work. It is planned to make available the large-scale programs developed, as a technological by-product of this effort. The present report is concerned only with the substantive aspects of the research.

The scoring and preparation of data for analysis and intercorrelations of the 600 items were processed on a CDC 3400 computer.[1] All subsequent analytic steps were completed on an IBM 360-50 computer system. The computer programs to be published are adapted to the 360 system.

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[1] This work was carried out by Mr. Nurhan Findikyan.

THE GUILFORD AND CATTELL PERSONALITY TRAIT SYSTEMS

GENERAL APPROACHES

Neither of the two trait systems with which this report is concerned is described in a single publication nor is either the result of a single study. On the contrary, both are most accurately described as incomplete stages of systematic developmental programs, covering years of work, technological shift from precomputer to computer methods, and significant revisions of concept, methodological approach, terminology, labeling, and format at various stages of development. The most comprehensive references to Guilford's system are the Guilford-Zimmerman monograph (1956) and his 1959 book. Cattell's system is most completely described in his 1957 book and also in his more recent popular exposition (1965).

Although factored trait systems are frequently discussed under the label, "trait theory," the theoretical aspects of this work are obscure, at least in relation to the common association of psychological theories with process relationships in behavior. Actually, factor analytic approaches, developed in the framework of psychometric analysis, have traditionally focused on structural relations among trait constructs, as well as on definition and clarification of traits.

In approaching the systematic description of behavior traits, Guilford and Cattell have proceeded from different orientations. Guilford has appeared to move deductively from a schematic concept of a particular universe or domain to the preparation of items and verification of factors representing the schema. This is not to say that he is dogmatic or that his revisions have not been guided by empirical evidence, as indeed they have, but rather that his schematic concepts, as shown in the matrix presented in his chapter on "Dimensions of Temperament" (Table 1), restrict his item pool and overlay his analytic efforts with the effect of an a priori blueprint of the structure, which is followed as a guide in his empirical work.

Guilford distinguishes between personality (temperament) and motivational (hormetic) factors on the same basis as does Cattell. Personality factors are stylistic, reflecting mood, tempo, speed, intensity, and other aspects of behavior style and are treated as bipolar by both, while motivational factors reflect dimensions of need or attachment to objects and activities and are unipolar.

Cattell's general approach is systematic but more frankly empirical. He began with an effort to approximate the universe of behaviors representing the stylistic personality domain, which he called the personality sphere, and then proceeded to the discovery of the factor structure by empirical methods. He depended on words descriptive of behavior, listing all such words in the dictionary initially, for his formulation of the domain, and his items were constructed as samples of this reference universe.

Guilford prefers orthogonal rotation to simple structure, believing that orthogonal factors are more parsimonious. On the other hand, Cattell, following his empirical orientation, believes that oblique rotation is more

Table 1. Guilford's Matrix of Temperament Factors.
(From Guilford, J. P. Personality. McGraw-Hill, 1959, p. 409.)

Kind of Dimension	Areas of Behavior Involved		
	General	Emotional	Social
Positive vs Negative	Confidence vs Inferiority	Cheerfulness vs Depression	Ascendance vs Timidity
Responsive vs Unresponsive	Alertness vs Inattentiveness	Immaturity vs Maturity	Socialization vs Self-Sufficiency
Active vs Passive	Impulsiveness vs Deliberateness	Nervousness vs Composure	Social Initiative vs Passivity
Controlled vs Uncontrolled	Restraint vs Rhathymia	Stability vs Cycloid disposition	Friendliness vs Hostility
Objective vs Egocentric	Objectivity vs Hypersensitivity	Poise vs Self-consciousness	Tolerance vs Criticalness

likely to yield factors that exist "in (human) nature" and that if they are naturally orthogonal the oblique rotation will leave them orthogonal. Both approaches are buttressed by strong support by cadres of their respective adherents.

ITEM POOLS

Apart from methodological considerations, perhaps the principal determiner of factor structure in any domain is the sample of items factored. It is therefore of great interest to determine how the Guilford item pool, developed from his perspective, compares with the Cattell item pool. This is not simply a matter of tabulation by content, since the two sets of items differ in other ways as well. The following comparison involves item structure, format, and density.

Item Structure

In general, Guilford's items are simpler in language structure than Cattell's. This is illustrated by the following examples of items of similar content from the two systems.

Guilford Items	Cattell Items
345. I would rather be a florist than a miner. (a) yes, (b) uncertain, (c) no.	8. I would rather be in a business office, organizing and seeing people, than an architect, drawing plans in the back room. (a) yes, (b)in between, (c) no.

Guilford Items	Cattell Items
412. I am sometimes the "life of the party." (a)yes, (b) uncertain, (c) no.	162. On social occasions, I: (a)readily come forward, (b) in between, (c)prefer to stay quietly in the background.
371. I always know what to do next. (a)yes, (b)uncertain, (c)no.	95. I like to be told how to do things instead of finding out for myself. (a)yes, (b) in between, (c) no.
452. I am often troubled about feelings of guilt. (a) yes, (b) uncertain, (c) no.	223. I don't feel guilty if scolded for something I did not do. (a) true, (b) uncertain, (c) false.
576. My parents' ideas of right and wrong have always proved to be best. (a) yes, (b) uncertain, (c) no.	109. I always make a point, in deciding anything, to refer to the basic rules of right and wrong. (a)yes, (b) in between, (c) no.

As shown in these sample items, Guilford's questions reflect simpler sentence structure in phrasing of items, a generally lower level of vocabulary, and less complex concepts than those of Cattell. Cattell's questions often appear to use specific cases to probe general areas, whereas Guilford's questions are more frequently stated in terms of the general case.

It is possible that these item structure differences could account for variations between the two sets of results, other things remaining equal, although such variations are usually thought of as affecting primarily, the reliability and reproducibility of results. In our judgment, they may also affect the factor structure when differences between factors, as reported, involve verbal distinctions that require education and high intellect to comprehend. Indeed, such distinctions as between Guilford's factors N - Nervous vs. Composed and D - Depression and Cattell's O - Guilt Proness and Q_4 - Ergic Tension not only depend on the effectiveness of the rotation procedures followed, but also require that the subjects make the expected distinctions in interpreting the questions. The assumption of correlated factors in Cattell's system suggests that individuals of lower intellect might produce second-order factors through their responses if their interpretations of his more complex questions miss the fine distinctions implied by his carefully worded, but subtle constructions.

Item Format. Guilford's items, as they appear in the Guilford-Zimmerman Temperament Survey, are presented in the second person, or "you" form, while Cattell's items, as in his 16 Personality Factor Test, are in the first person, "I", form. All of Guilford's items are answered yes ? no, while Cattell has employed a variety of types of three-choice response, including yes uncertain no, yes in between no, true in between false, and others in which the choices are part of the question, as in sample item 162, above. These variations are not believed to be of sufficient importance to account for major differences in factor structure, although the format variations in Cattell's items may further illustrate the higher intellectual demands of his questionna . On the other hand, it could be asserted that precisely such format variations add interest, break the monotony of the test, and permit more flexibility in item construction.

Item Density

Guilford's factor analyses have typically been based on homogeneous item clusters, while Cattell's have been based on items. For example, Guilford's Factor A - Ascendances vs. Submissiveness, as included in the present study, consists of 17 items divided into five clusters with 3, 7, 3, 4, and 3 items, respectively, providing four cluster scores to represent the factor. On the other hand, Cattell's related Factor E - Dominance vs. Submissiveness, is represented by 19 individual items sampled from the factor domain. An attempt was made by the senior author to order these into clusters and six clusters, with 2, 3, 2, 3, 2, and 2 items each, were identified, but five additional E items included could not readily be clustered. The two sets of items are listed below for comparison. In this list, the Guilford items have been transformed to first person form, as used in the present study.

Guilford Factor A

1. Being Conspicuous

315. I usually hesitate to take a seat in the front of a lecture room or church if doing so makes me appear conspicuous.

316. I dislike having people watch me while I am working.

317. I usually speak out in a meeting to oppose someone I feel sure is wrong.

Cattell Factor E

1. Self-Described Superiority

60. I have some characteristics in which I definitely feel superior to most people.

61. People have sometimes called me a proud, "stuck-up" individual.

Guilford Factor A

2. Maintaining One's Rights

318. When a clerk in a store waits on others who should come after me, I usually call his attention to this fact.

319. I let others "run over me" more than I should for my own good.

320. If I hold an opinion that is radically different from that expressed by a lecturer, I usually tell him about it either during or after the lecture.

321. I always stand up for my rights when they are endangered.

322. When I am served stale or inferior food in a restaurant, I usually make a vigorous protest about it.

323. When I find that a piece of merchandise I have bought is defective, I find it easy to demand an exchange or refund.

324. I hesitate about calling down a person who does not play fair.

3. Self-Defense

325. I find it difficult to get rid of a salesman to whom I do not care to listen

Cattell Factor E

2. Disregard for People's Feelings

62. I make smart, sarcastic remarks to people if I think they desirve it.

63. I occasionally tell strangers things that seem to me important, regardless of whether they ask about them.

64. I like to avoid saying unusual thins that embarrass people.

3. Disregard for Authority

65. If I disagreed with a class teacher or his views, I would usually: (a) keep the opinion to myself, (b) uncertain, (c) tell him in class that my opinion differs.

66. I have on occasion torn down a public notice forbidding me what I felt I had a perfect right to do.

4. Self-Determination

67. I like to be told how to do things instead of finding out for myself.

68. It is more important to: (a) get along smoothly, (b) in between, (c) get your own ideas put into practice.

69. I believe that the most important thing in life is to do as I like.

5. Meeting Challenges

70. If the odds are really against something's being a success, I still believe in taking the risk.

Guilford Factor A

326. I am rather good at bluffing when I find myself in difficulty.

327. I can always think of a good excuse when the situation demands it.

4. Social Initiative

328. I have, on my own initiative, organized a club or group of some kind.

329. I like to take on new and important responsibilities such as organizing a new business enterprise.

330. I like to take the initiative to enliven a dull party.

331. When present, with others, at the scene of an accident, I usually take an active part in helping out if needed.

5. Fear of Social Contacts

332. I find it difficult to solicit funds even in a cause in which I am interested.

333. I like to sell things (that is, to act as a salesman).

334. I have, on occasion, been hesitant about making an application for a job in person.

Cattell Factor E

71. I think I am better at showing: (a) nerve in meeting challenges, (b) uncertain, (c) tolerance of other people's wishes.

6. Acceptance of Assertiveness

72. I dislike people who are too self-confident and act as if they are superior to the general run of humanity.

73. It annoys me to hear people say they can do things better than others.

7. Residual Items - Not Clustered

74. When telling a person a deliberate lie I am ashamed to look him in the eye and have to look away.

75. The use of foul language, even when it is not in a mixed group of men and women, still disgusts me.

76. I'd be extremely embarrassed to tell people I'd spent my vacation at a nudist camp.

77. I am quite happy to be waited on, at appropriate times, by personal servants.

78. I would rather do without something than put a waiter or waitress to a lot of extra trouble.

The preceding illustration, which is representative of most of the factors in the two systems, demonstrates that Guilford's factors are based on relatively small numbers of homogeneous, dense clusters of highly similar items, while Cattell's factors are composed of less densely spaced, more heterogeneous items, coverning a wider range of content and more difficult to cluster. These observations are supported by the item intercorrelations, which are uniformly higher within source factors for the Guilford than the Cattell items. It is as though Guilford's map of the personality domain is studded with groups of clusters of tall trees, while Cattell's map is marked by more widely dispersed clumps of bushes. These two types of maps appear to reflect quite clearly the contrasted strategies of the two investigators and the respective concepts of the personality domain.

Item Content

In addition to the variations discussed above, in relation to item structure, format, and density, there are interesting and substantial differences between the two item pools with regard to specific content and emphasis in areas denoted by reasonably comparable terms. For example, assuming from the trait description that Guilford's Factor A - Ascendance and Cattell's Factor E - Dominance should relate to the same general trait, we can compare the two sets of items, listed above. Even a casual glance at the cluster titles shows, however, that they are slanted differently and cover different behaviors. Guilford's A items are concerned with being conspicuous in public, maintaining and defending one's rights in relation to others, taking the initiative in social situations, and assertiveness in social contacts. The whole appears to reflect self-enhancement and defense in social situations, with more emphasis on defense than enhancement. By contrast, Cattell's items in Factor E lean more to self-enhancement and assertiveness. They include items on self-appraisal of superiority, disregard for the feelings of other people, disregard for authority, self-determination, meeting challenges, and acceptance of assertiveness in others. On the basis of the item content identity would most certainly be considered unlikely and the correlation between the sets is difficult to estimate.

The 600 items, printed in the test booklets used in this study, are identified in Appendix 1. In Appendix 2 they are grouped by source factors and clusters. It is necessary to study the items intensively, comparing items in different factors and clusters from the two source sets, to obtain a detailed grasp of the variations in content. However, some significant clues concerning the range and orientation of the items is given in the following analysis of the two sets of items by cluster. The cluster titles for the Guilford items are his; those for the Cattell items were proposed by the senior author at the time that item selections were under consideration. Residual Cattell items, not included in clusters, are omitted in this discussion, but may be reviewed in Appendix 2.

Let us consider first those factors in both the Guilford and Cattell systems, which reflect various aspects of self-concern, emotionality, anxiety, and neuroticism. These include Guilford's factors I, N, T (in part), D, C, O, and Co, listed below, and Cattell's factors C, D, H, L, O, Q_3, and Q_4. With the exception of D, which is also omitted from Cattell's 16 Personality Factor Test, the Cattell group defines his second-order anxiety factor. The two groups are related to what Eysenck has defined as Neuroticism, although comparison with his work is beyond the scope of this report.

The cluster titles of the 14 selected factors are as follows:

Guilford

Factor I - Inferiority vs. Confidence

1. Personal strengths and weaknesses
2. Feeling of adequacy
3. Self-confidence vs. inferiority feelings
4. Discontent with self and status

Factor N - Nervousness vs. Composure

1. Tense and excited vs. calm and relaxed.
2. Restlessness
3. Nervousness and jumpiness
4. Annoyance and irritability
5. Fatigueability

Factor T - Thoughtfulness

1. Meditativeness
2. Liking for serious thinking
3. Analysis of self and others

Factor D - Depression

1. Emotional depression
2. Worry, anxiety
3. Cheerfulness

Cattell

Factor C - Ego Strength

1. Phobias
2. Energy, health
3. Ability to change
4. Satisfaction with life
5. Frustration tolerance
6. Inferiority
7. Projection
8. Fear of animals
9. Sleep disturbance
10. Admiration of parents

Factor D - Excitability

1. Angered by frustrating events
2. Angered by rejection
3. Distractibility
4. Resentment of superiors
5. Low excitability threshold

Factor H - Threctia vs. Parmia

(Timid, shy vs. venturesome, bold)

1. Open approach to opposite sex
2. Absence of shyness, inferiority, and insecurity in social relations
3. Dislike of public attention

4. Loveliness
5. Physical depletion
6. Feelings of guilt

Factor C - Cycloid Disposition

1. Emotional fluctuations
2. Emotional excitability
3. Emotional perseveration
4. Emotional immaturity
5. Absentmindedness
6. Daydreaming

Factor O - Objectivity

1. Egocentrism
2. Hypersensitivity
3. Ideas of reference
4. Sympathy

Factor Co - Cooperativeness with the Environment

1. Faultfinding with human nature
2. Faultfinding with society
3. Faultfinding with industrial injustices
4. Trusting honesty in others
5. Suspicion of hypocricy
6. Suspicious of action of others
7. Victim of hard luck

Factor L - Alaxia vs. Protension

(Trusting, adaptable vs. suspicious)

1. Pessimism regarding international relations
2. Paranoid attitudes, suspiciousness
3. Hostility towards "superior" individuals
4. Retaliation to injustice

Factor O - Guilt Proneness

(Placid, calm vs. apprehensive, worried)

1. Free floating anxiety
2. Sensitivity to criticism
3. Sensitivity to rudeness
4. Pessimism
5. Excessive emotionality

Factor Q_3 - Group Dependent vs. Self-Sufficient

1. Deliberateness in speech and thought
2. Deliberateness in action
3. Unruffled by environment

Factor Q_4 - Ergic Tension

1. Moodiness
2. Edginess, restlessness
3. Impulse control
4. Anxiety proneness, anxious disposition

It is at once apparent that there is much in common between these two sets of factors, as well as among factors in both sets. On the first point, conceptual congruences appear between Guilford's I and portions of Cattell's C and H; also between Guilford's N and Cattell's Q_4, Guilford's Co and T_3 and Cattell's L, portions of Guilford's D and O and Cattell's O, and portions of Guilford's C and Cattell's D. However, the overlap among factors within sets, at least in relation to the verbal descriptions afforded by the cluster titles, is both considerable and different among Guilford and Cattell factors. In some cases, clusters in one factor might easily be transferred to another and only the weight of empirical evidence could overcome decisions based on inspection of content.

A second grouping of factors involves various stylistic aspects of relating with others. These include Guilford's G, A, M, S, R, and Ag and Cattell's A, E, F, H, I, J, Q_1, and Q_2. This grouping includes Cattell's second-order factor Exvia (Introversion-Extraversion), composed of his A, F, H, and Q_2, but also factors dealing with masculinity, level of activity, group dependence, and dominance. The factors and cluster titles are as follows:

Guilford

Factor G - General Activity

1. Rapid pace
2. Drive for activity
3. Energy
4. Liking for action
5. Quickness

Factor A - Ascendance vs. Submissiveness

1. Being conspicuous
2. Maintaining one's rights
3. Self-defense
4. Social initiative
5. Fear of social contacts

Cattell

Factor A - Sizothymia vs. Cyclothymia

1. Preference for activities involving social interactions
2. Preference for contact with people

Factor E - Dominance vs. Submissiveness

1. Self-described superiority
2. Disregard for people's feelings
3. Disregard for authority
4. Self-determination
5. Meeting challenges
6. Acceptance of assertiveness

Guilford

Factor M - Masculinity

1. Fearfulness
2. Inhibition of emotional expression
3. Masculine vocational preferences
4. Masculine avocational preferences
5. Disgustfulness
6. Sympathy

Factor S - Sociability

1. Liking for friends and acquaintances
2. Social leadership
3. Social poise
4. Liking the limelight
5. Shyness, bashfulness
6. Gregariousness

Factor R - Restraint (Rhathymia)

1. Carefreeness vs. restraint
2. Impulsiveness
3. Seriousness vs. unconcern
4. Liking for action and excitement
5. Reticence
6. Rapport with the environment

Factor Ag - Friendliness

1. Contempt of others
2. Resistance to control
3. Hostility
4. Overt aggression

Cattell

Factor F - Surgency vs. Desurgency

1. Seeking excitement
2. Interest in parties and social functions
3. Enjoys being life of party, fun role

Factor H - Threctia vs. Parmia

listed in preceding grouping

Factor I - Harria vs. Premsia (tender vs. tough minded)

1. Artistic, sensitive attitude
2. Feminine interests
3. Feminine scholastic and vocational choices

Factor J - Coasthenia vs. Zeppia

1. Sense of humor
2. Trusting and forgiving - faith in human beings.
3. Thoughts of being alone
4. Detachment from group activities

Factor Q_1 - Conservatism vs. Radicalism

1. Seeking new methods
2. Antagonism to old ways
3. Intellectualism
4. Advocacy of new moral standards
5. Elevation of reason and logic

Factor Q_2 - Group Dependent vs. Self-Sufficient

1. Preference for working alone
2. Preference for living by own standards
3. Self-sufficiency in use of reference material

On the basis of this analysis of content, the components of Cattell's second order introversion-extraversion factor appear to resemble closely the behavior aspects represented by Guilford's factors A and S, and also perhaps portions of M, R, and Ag. Partial congruences between Guilford's M and Cattell's I and Guilford's Ag and Cattell's E appear possible as well. However, there are no analogues in Cattell's system to Guilford's G, or in Guilford's, to Cattell's Q_1. In addition, the scope of behavior represented by the factors listed, in both systems, varies widely and any hope of factor by factor matching appears to be, as noted earlier, quite unrealistic.

What appears, through analysis of content, to be a fair match is the correspondence between Guilford's factor CC and Cattell's G, listed below. The similarity of concepts represented in these two factors is striking despite the fact that Guilford's items focus mainly on conformity with rules and expectations of the culture, while Cattell's items, in keeping with the factor title, pay greater attention to moral compulsion as a source of self-discipline. However, in his major systematic work, Cattell (1957) specifically noted that although "good" behavior may be motivated interchangeably by conformity or compulsion, the behavior resulting cannot be distinguished. We would therefore expect a match of CC and G.

Guilford	Cattell
Factor CC - Cultural Conformity	Factor G - Superego Strength
1. Conscience satisfaction	1. Admiring moral character
2. Conformity	2. Conscientiousness-responsibility
3. Competition	3. Conscientiousness-efficiency
4. Maintenance of discipline	4. Service to church, community, family
5. No-nonsense	5. Adherence to right - rules

The remaining factors do not appear to have obvious counterparts in the "other" system. Guilford's factor AA - Artistic Interest properly belongs in his hormetic trait category, but was included in the present study on Guilford's recommendation that it may have stylistic implications. Cattell's factors M and N are both included in the 16 PF Test.

Guilford

Factor AA - Artistic Interests

1. Drama
2. Music
3. Literature
4. Graphic Arts

Cattell

Factor M - Practical, Conventional vs. Bohemian

1. Hostility towards conventional, dull, unintelligent people
2. Self-perception as unusual, impractical person
3. Sensitive idealism

Factor N. Artlessness vs. Shrewdness

1. Alertness to propoganda
2. Preference for polite, sophisticated people
3. Sophisticated, polite
4. Dislike for routine work
5. Low frustration tolerance

HYPOTHESES CONCERNING RELATIONSHIPS

The analysis of the range of content in the Guilford and Cattell item pools suggests at least three major areas of correspondence, related to anxiety-neuroticism, introversion-extraversion, and conformity-superego function. In view of the content, suggested by cluster titles in both sets of factors, factor by factor matching appears unlikely, however, except in the case of CC and G, as discussed above. Instead, it seems most likely that factors common to both systems may draw from more than one factor in each set, particularly if the analysis is based on a common item matrix.

The results reported by Cattell and Gibbons (1968), mentioned above, reflect some of the correspondences noted in the preceding section, such as M with Cattell's I, N with O, and S with H. On the other hand, Cattell and Gibbons reported Cattell's M and Q_2 as factors having common variance with Guilford's factors; this appeared unlikely in the preceding discussion. They listed Cattell's C, F, G, L, and Q_3, along with E, as independent of the Guilford structure, and Guilford's AA as independent of the Cattell structure. With the exception of AA and E, these latter results are also inconsistent with our conceptual analysis of the Guilford-Cattell relationships.

A major concern in the present study, which has grown as the work proceeded, involves a substantial number of discrepancies, in both item pools, between item reference, as it appeared to the critical eye of the investigators, and factor label assigned to an item. While it is acknowledged that selection of salient item factor markers must depend heavily on empirical evidence, the inclusion of closely similar items on different factors, by both authors, has been a matter of continuing perplexity to the present investigators. As a result, it was decided to scrutinize item intercorrelations within clusters and within factors as a basis for the final strategy in the present study. Unless within-cluster and within-factor correlations are discriminably higher than correlations with other items. The factor labels assigned to individual items in the source systems would be difficult to justify. Then, in studying the correspondences and differences in factor loadings of items from the two sets, in a common matrix, it would be appropriate to consider item content as a matching criterion as well as or in lieu of source factor labels.

The procedures and results of the present study are presented below. However, at this point, the order of reporting must be anticipated to mention that inspection of item intercorrelations did reveal that in many cases item source labels could not be considered as final and that the interpretation of factors obtained in the present analyses on the basis of item content in preference to source factor was considered appropriate. Of course, factor labels were not disregarded, and the comparison of the two approaches to interpretation is instructive.

In summary, the hypotheses concerning relationships expected between the two personality factor systems are stated in general terms rather than on the basis of factor-to-factor correspondences. Although Cattell (Cattell and Gibbons, 1968) appears to prefer to discuss his and Guilford's factors as indivisible entities, our detailed reading of items, item clusters, and factor lists suggests that the overlap between the two systems is more complex and should be considered in terms of the total item pools. Considerable overlap on three major dimensions, anxiety-emotional stability, extraversion-introversion, and cultural conformity-superego function, was noted on the basis of content analysis. Masculinity and hostility-aggression were also mentioned as areas of relationship between the two systems. In addition, several areas of independence between the two were also observed. In particular, Guilford's general activity (G) and artistic interest (AA) items had no obvious matches in the Cattell matrix and conversely, no apparent matches in the Guilford matrix were seen for Cattell's Q_1 - Conservatism vs. Radicalism, M - Practical, Conventional vs. Bohemian, and N - Artlessness vs. Shrewdness, although some items in these factors might undoubtedly have loadings on factors related to Guilford item content.

SPECIFICATION OF THE PRESENT INVESTIGATION

This study was undertaken in an effort to understand and clarify the relations between the personality factor systems developed by J. P. Guilford and by Raymond B. Cattell. The research was based on item pools of 300 factor markers each, representing 15 Guilford factors and 17 Cattell factors, selected by the senior author with the assistance and approval of the two source authors. The factors included, with the number of items representing each, are as follows:

	Guilford
G	General Activity (14)
A	Ascendance vs. Submissiveness (20)
M	Masculinity (30)
I	Inferiority vs. Confidence (24)
N	Nervousness vs. Composure (19)
S	Sociability (21)
T	Thoughtfulness (11)
D	Depression (14)
C	Cycloid Personality (21)
R	Rhathymia (Restraint) (17)
O	Objectivity (16)

	Cattell
A	Sizothymia (Reserved, Cool) vs. Cyclothymia (Outgoing, warm)(20)
C	Ego Strength (Emotional Stability(20)
D	Excitability (19)
E	Submissive vs. Dominant (19)
F	Desurgency vs. Surgency (19)
G	Superego Strength (19)
H	Threctia (Shy, Restrained) vs. Parmia (Venturesome, Bold) (19)
I	Harria (Tough Minded) vs. Premsia
J	Coasthenia (Fatigue) vs. Zeppia (Obstructive Independence) (18)

Guilford

Ag	Friendliness (Agreeableness) (16)
Co	Cooperativeness (Acceptance of things as they are) (32)
AA	Artistic interest (20)
CC	Cultural Conformity (25)

Cattell

L	Alaxia (Trusting, Adaptable) vs. Protension (Suspicious) (16)
M	Praxernia (Practical, Conventional) vs. Antia (Bohemian) (16)
N	Artlessness vs. Shrewdness (16)
O	Untroubled Adequacy vs. Guilt Proneness (16)
Q_1	Conservatism vs. Radicalism (16)
Q_2	Group Adherence vs. Self-Sufficience (16)
Q_3	Casual vs. Controlled (Self-concept Control) (16)
Q_4	Ergic Tension (16)

The objectives of this investigation required a series of analytic steps. In order to determine common elements in the two sets of items, representing Guilford and Cattell factors, two major analyses were undertaken: (1) factor analysis of the total 600 x 600 item matrix, and (2) separate factor analyses of the 300-item Guilford and Cattell matrices, with factor loadings for the "other" set estimated for each by means of the Dwyer extension. On the basis of these analyses, data were obtained concerning factors common to the two item pools, factor loadings of individual items on these factors, and also on the relations of the source factors to the empirical factors extracted from the present matrices.

After analyzing the overlapping factors, the next steps were directed at areas of independence of items and factors of the two systems. Toward this end, the Guilford matrix was reduced by removing variance attributable to Cattell-item factor loadings and the Cattell matrix, by removing Guilford variance. Then the two residual matrices were separately factor analyzed. The resulting factors in each matrix represented variance in each that was independent of the other.

Numerous supplementary procedures were completed in support of these two major analyses. These are mentioned in the discussion of procedures and results. The most important of these involve estimates of the correlation between empirical and source factors and computation of coefficients of congruence among all of the rotated empirical factors.

Many procedures that might have been employed on smaller-scale analyses were set aside in the present study because of the sheer magnitude of the computations involved. For example, the diagonal communality estimates were the highest correlation coefficients in the arrays rather than either the squared multiple correlation coefficient or a precise estimate arrived at by iterative procedures. Such decisions were made after careful assessment of alternatives and consultation with expert advisers. However, in anticipation of criticism that may be inevitable under the circumstances, the essential data for all computations have been retained on computer tapes and will be made available to any qualified investigators who desire to carry this work further. Despite the shortcomings of the present study, however, which are pointed out below, it is believed that the results are meaningful and impressively consistent and add substantially to present understanding of personality traits measured by questionnaires.

PROCEDURES

This section describes the selection of factors and item factor markers, the item and test formats adopted, the subject sample, the administration of the experimental test booklets, procedures for scoring and review of protocols, and the decisions and procedures adopted for analysis of the data. As noted above, the printed booklets and a detailed listing of items by factor and cluster appear in Appendices 1 and 2, respectively.

SELECTION OF FACTORS AND ITEM FACTOR MARKERS

Since the main objective of this investigation involved comparison of the Guilford and Cattell trait systems, deference was paid to the opinions of Professors Guilford and Cattell in the selection of factors to be included and of items to represent these factors. At the same time it was necessary to maintain balance both between and within the two systems and to conform with decisions concerning uniform format and other procedural requirements. The cooperation and gracious assistance of both principals aided materially in getting the project organized and their objectivity and impartiality was especially noteworthy.

Guilford supplied a list of 346 items used by Guilford and Zimmerman (1956); these were grouped into 69 clusters representing 13 factors. Eighty-two of the items were marked as minimally important to their respective clusters, in the event that reduction of the list was required. In addition, Guilford recommended inclusion of factors AA - Artistic Interest and CC - Cultural Conformity, from his DF Opinion Survey (Guilford, Christensen, and Bond, 1954) on the basis that they both reflected personality dimensions related to Cattell factors. Each of these factors was represented by 30 items and their inclusion expanded the Guilford source item pool to 406 items. This number was reduced to 300 by the senior author by the deletion of the 82 marked items, plus a few others and the final list was approved by Professor Guilford.

The Cattell item pool consisted initially of some 750 items from various experimental and published versions of the 16 Personality Factor Test (see Cattell, 1957) and represented 17 factors enumerated in the preceding section. Fifteen of these are included in the current 16 PF test; factor B-Scholastic Mental Capacity was omitted from the study since it was believed to represent ability variance more than stylistic personality variance. It would have been interesting to retain this factor in the study, but the pressure of time and space prevailed. The two additional factors, included on Professor Cattell's recommendation, were D - Excitability and J - Coasthenia vs. Zeppia, described by Cattell (1957). The entire list of 750 items was grouped by factor source and sorted into clusters by the senior author and a research assistant (N. Findikyan) independently prior to the selection of 300 items by the senior author. The final list, which includes items not included in clusters, but regarded as important factor markers by Cattell, was adopted in consultation with him. These items are designated as residuals within each factor listed in Appendix 2.

ITEM AND TEST FORMATS

As noted earlier, both the Guilford and Cattell items are three-choice items. Guilford's items were standardized in a Yes ? No format, while Cattell used a variety of choices involving Yes - No, True - False, and elements of the question for the extremes and in between or uncertain for the middle response. In addition, the Guilford source items were in second person form, while the Cattell items were in first person form.

With the approval of Guilford and Cattell, the uniform format adopted for this study involved the three-response choice set-up, as provided in the source items, but with the words in between, uncertain, sometimes, or the like, whichever was most appropriate to the language of the item, as the middle choice instead of a question mark. All items were converted to first person form.

The complete items were reproduced in the test booklet, with the questions in regular type and the response choices in darker (bold) type. This was done in order to permit the efficient use of an answer sheet on which the choices were indicated only by the letters a, b, and c, printed above the dotted lines provided for the response. Copies of the answer sheets are included with the test booklets in Appendix 1.

The 600 items were randomized in order and printed in two test booklets of 300 items each. For the experimental administration the test booklets were entitled, Adult Opinion Survey, Form A and Form B. Different colors were used on the two booklets to avoid confusion and item numbers were identified on the answer sheets by page number and section (top or bottom half) to facilitate accurate responding. The answer sheets were printed for scoring on the IBM 1230, Optical Mark Reader, which permitted the recording of 150 item responses on each side of a sheet. Thus one sheet was used as the answer sheet for each 300-item booklet. The two answer sheets were also printed in different color ink.

The format employed, which was adopted after consideration of several alternatives, worked extremely well. In particular, the optical scanning answer sheets were efficient and insensitive to smudges and perspiration stains which occurred during several of the testing sessions in hot weather.

SUBJECT SAMPLE

Inasmuch as the basic variables to be analyzed were the 600 personality items, it was desired to administer the booklets to a large sample of subjects, that would exceed the number of items by a factor of at least three. It was estimated that the testing time per subject would require not less than three hours. This precluded the use of college student samples, as in the case of the Gibbons study, referred to above. Discussions were held with representatives of the personnel research organizations of the three military services and arrangements were made to administer the booklets to basic airmen undergoing indoctrination training at Lackland Air Force Base, Texas.[1]

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[1] The testing at Lackland AFB was enabled through the efforts of Dr. Ernest C. Tupes, Chief, Personnel Selection and Classification Research Branch, Air Force Personnel Research Laboratory, whose supervision and quality control of the testing aided materially to the success of the effort.

The experimental test booklets were administered to 2550 airmen in regular morning or afternoon testing sessions of three hours duration, scheduled as part of the Air Force Personnel Laboratory routine experimental testing program. Both forms were administered at a single session, with a short break at midpoint. The order of adminstration of the two forms was alternated from session to session to rotate the effects of order, fatigue, and possible boredom. The second form was begun after the break even if the previous one was not complete. As a result there were a number of incomplete cases.

In conformity with an Air Force requirement, names were not permitted on the answer sheets. Every answer sheet was preprinted with a unique serial number and these numbers, recorded on roster cards, enabled matching of forms for individual subjects.

It was feared at first that anonymity might have the effect of encouraging frivolous response tendencies and as a result the answer sheets were screened extensively for facetious remarks, disregard of instructions, runs, and stereotyped response patterns. In addition, incomplete sets were identified, using an arbitrary definition of five per cent (30 responses) omissions as tolerable. It was found that for various reasons, 449 cases could not be used; the greatest majority of these were incomplete according to the arbitrary five per cent definition. The resulting sample of 2011 cases was retained for analysis.

The final sample, which involves 3.35 times as many subjects as variables, consists of 2011 male Air Force recruits who participated on the study as part of their routine assigned duties during their indoctrination training at Lackland Air Force Base in 1965 and early 1966. Table 2 presents distributions of age and category score on the Armed Forces Qualification Test. The age range was from 17 to 25, with a modal frequency at 18 and with approximately 87 per cent of the cases in 18 to 20 age range. The AFQT scores were available for slightly less than half of the subjects (46 per cent). The distribution for these men ranged from the low 20's to the maximum of 95, with a median around 52. This range is more representative of a population of American young men than would have been available on a college campus.

ADMINISTRATION OF EXPERIMENTAL BOOKLETS

The testing was initiated in August, 1965; 1846 subjects were tested in August and September. An interruption of testing sessions occurred in September and the schedule was interrupted for several months. It was resumed in March, 1966, when over 700 additional cases were obtained. Tests were administered in groups of about 170 men by trained examiners under the superivision of Mr. G. G. White, Chief, Testing Branch, Air Force Personnel Research Laboratory.

The experimental booklets were presented as an opinion inventory for adults rather than as a "personality" test and the instructions, printed on the first two pages of both forms, emphasized that there are no right or wrong answers. The instructions focused also on the mechanics of the optical scanning answer sheet and on the importance of answering accurately and completely. Subjects were instructed to use (a) and (c) responses for all items, "except when the answer at either end is really impossible for you."

Table 2. Distributions of Age and AFQT Score for Final Sample. Frequencies are reported in percentage form.

Age (years)	Per Cent	AFQT Score*	Per Cent
21	1.2	90-99	6.8
21	6.2	80-89	17.8
20	27.5	70-79	8.6
19	24.5	60-69	14.5
18	33.7	50-59	15.1
17	5.5	40-49	12.9
		30-39	14.8
		20-29	9.2

*AFQT Scores were available for only 46 per cent of the sample.

There were no problems with the instructions and the three-hour period was sufficient for most subjects. Some of the men were uncomfortable on early testing days when the summer heat in San Antonio was at a peak and there were perspiration marks on many of the answer sheets. Fortunately, the effects were minimal as this did not interfere with the optical scoring system.

SCORING

The scoring process was principally a matter of screening the answer sheets for omissions, runs, stereotyped response patterns, and other forms of noncompliance with instructions and then transferring the responses from the answer sheets to punch cards. Punching was done automatically by the IBM 1230 Optical Mark Reader, which proved to be a magnificent time-saver, but decisions had to be made first concerning the handling of omissions and deviant answer sheets.

Inspection. Answer sheets were inspected visually for evidence of noncompliance with instructions, gross frequencies of omissions, and refusals to answer. Run and stereotyped response pattern checks were made using editing routines designed for the IBM 1230 machine. Of the total number of over 2500 tested, 489 cases were removed from the sample, mostly because they exceeded the limit of more than 30 (5 per cent) items omitted.

Incomplete Responses. In order to have complete data for every subject, responses were inserted arbitrarily for omissions. The inserted response was the modal response for the respective item based on the total sample retained.

Item Reflection. Appendix 2 indicates the direction (a or c) in which each item included in the study was keyed in the source trait from which it was derived. In order to facilitate ease of interpretation, the initial raw data deck was transformed into a revised deck in which some items were reflected so that the direction of scoring was identical for all items in each source trait.

Item Scoring. After reflection of items to insure uniform polarity, responses were scored 0, 1, and 2 respectively for a, b, and c choices. The 1230 machine was programmed in this way and the cards were punched. Matching of answer sheets for Forms A and B assured that responses for all 600 items for each subject were identified as a set.

ANALYSIS OF DATA

The methods used were straightforward and followed the general outline mentioned earlier. This section specifies the decisions made concerning computations and describes the procedures in sufficient detail to permit replication of the study.

Computational Decisions

Type of Correlation Coefficient. The first important computational decision faced involved the type of correlation coefficient to be used in generating the correlation matrices. Tetrachoric coefficients were recommended by several advisers, including Guilford, but these were also objected to by other advisers, including Cattell, on the grounds that they tend to overestimate the correlations. The decision to employ the product-moment coefficient was made by the senior author on the grounds that it involved the least number of assumptions.

Method of Factoring. Originally it was planned to use the Overall-Porterfield Powered Vector Method of factor analysis, which had been found often by the present writers as well as others to give a good approximation of a Varimax-rotated Principal Factor solution. A program for this method had been developed for the Control Data Corporation 3400 computer in previous research and was adapted without excessive difficulty to the large-scale matrices for the present study. This program was run on the 600 x 600 matrix and 23 factors were extracted. However, examination of the factor loadings revealed difficulties, principally that the results were difficult to interpret. It was decided that the method, as published, was appropriate to matrices with relatively high correlations, but that it encountered difficulties when the correlations were of the generally low magnitudes that prevailed in the present study (see Table 3).

At this point a conference was held with Dr. Overall, who proposed a modification of the method that might overcome the difficulties encountered. However, further consultation with other colleagues persuaded the investigators that, in view of the initial implications of the study, the widely accepted Principal Factor Method should be used. This decision necessitated the development of a Principal Factor program. Programs for Varimax and Promax rotation

Table 3. Percentage distribution of correlation coefficients in the three matrices, showing per cent by range of magnitude.

Range of Correlation Coefficient	Total Matrix 600 x 600	Guilford Matrix 300 x 300	Cattell Matrix 300 x 300
> .29	.5	1.0	0.3
.25 - .29	.9	1.4	.6
.20 - .24	2.4	3.6	1.5
.15 - .19	5.9	7.8	4.3
.10 - .14	14.0	16.3	12.1
.05 - .09	30.7	30.2	30.9
.00 - .04	45.6	39.7	50.3
	100.0	100.0	100.0

were also prepared. The Varimax rotation (Kaiser, 1958) provides an orthogonal solution and the Promax (Hendrickson and White, 1964), an analytic oblique solution that gives a least-squares fit to a target matrix consisting of the signed fourth powers of the Varimax loadings. The two rotation methods were selected in view of the approaches used by Guilford, whose work is based on orthogonal rotations, and Cattell, who has followed the practice of oblique rotation.

Diagonal Elements. The diagonal elements in the correlation matrix represent the communality estimates for the respective variables. There is no standard method of estimating the communalities; however, such methods as those of the squared multiple correlation of each variable with all of the remaining variables or repetition of the factorization for a given number of factors, were infeasible in the present study because of the cost and complexity of the computations that would have been required. The expedient solution, which is believed adequate for the purposes of the analyses performed, was to enter the highest correlation in the array for each variable as the diagonal value. Several consultants concurred on this decision.

Cessation of Factoring. The number of factors extracted obviously influences the rotation and structure obtained. As in the case of diagonal elements, there is no standard convention to decide this issue. Cattell's Scree (1967) has much to recommend it, but was not feasible in the present study. In the present analyses, instead of relying on a single criterion for the number of factors, an examination was made of the variance (sum of the squared loadings) associated with successive factors, magnitudes of the loadings of the variables, and tabulations of residuals following the extraction of each factor.

For the 600 x 600 matrix, 23 factors were extracted. Although the sum of the squared loadings of the 600 variables on Factor 23 was 1.66 there were only 3 variables with loadings .20 or greater in magnitude, and the tabulation of residuals revealed that only 116 of the 179,700 different residuals reached or exceeded .10 in magnitude. On this basis, it was believed that no purpose would be served in extracting further factors. Without going into detail, it can be stated that decisions were reached in a similar manner with regard to the number of factors to be extracted from the two 300 x 300 matrices.

Number of Factors to be Rotated. In the case of the 600 x 600 matrix, a further examination of the factor variances, magnitudes of the loadings, and residuals left some doubt as to whether the first 15 or the first 18 factors should be entered into rotation. Therefore, as discussed below, both sets of factors were rotated by the Varimax and Promax methods.

Steps in the Analysis

The various analyses described above produced the following results:

(1) Principal Factor Analysis of the 600 x 600 matrix.

Varimax rotation of 15 factors
Varimax rotation of 18 factors
Promax rotation of 15 factors
Promax rotation of 18 factors

(2a) Principal Factor Analysis of the Guilford 300 x 300 matrix with estimation of Cattell item loadings by Dwyer extension.

Varimax rotation of 12 factors
Promax rotation of 12 factors

(2b) Principal Factor Analysis of the Cattell 300 x 300 matrix with estimation of Guilford item loadings by Dwyer extension.

Varimax rotation of 11 factors
Promax rotation of 11 factors

(2c) Principal Factor Analysis of Guilford Residual Matrix

Varimax rotation of 8 factors
Promax rotation of 8 factors

(2d) Principal Factor Analysis of Cattell Residual Matrix

Varimax rotation of 7 factors
Promax rotation of 7 factors

In addition to the above, coefficients of congruence were computed among all of the rotated factors of all twelve of the analyses enumerated above and cluster correlation coefficients were computed between extracted and source factors for the items used as markers of the Guilford and Cattell source factors. The coefficient of congruence was named by Tucker (1951), but developed by Burt (1948). It is an index of the relationships among the loadings on two factors which can be interpreted in a manner similar to that of product-moment correlation coefficients.

The cluster correlation coefficients computed to compare the empirical factors with the source factors were obtained as follows. A source factor was arbitrarily defined as the sum of the z scores of items included from one of the Guilford or Cattell factors, with equal weighting of the items and reflection of items in accordance with the direction of scoring in the source. Using the method described in Harman (1967, sec. 11.3), correlations were computed between source factors and the empirically derived, Varimax-rotated factors. The variance term for each source factor was obtained by summing the intercorrelations among items composing that source factor, with unit variances for each item. Variances of the empirical factors were all unity, since the factor vectors were scaled to unit length. Because Varimax factor loadings can also be considered as correlations between the items and the empirical factors, the covariance between a source factor and an empirical factor could be obtained as the sum, across items in a source factor, of the loadings on a Varimax factor.

RESULTS

The detailed results of the various analyses performed comprise a sheer volume of computer output that defies compression into a readable report. The essential data are available on tape and in printout form for review and analysis by other scientists. They are presented here only in summarized and digested form.

CORRELATION MATRICES

For a sample of 2011 subjects a correlation of .04 would be significant at the .05 level and one of .07, at the .01 level. The item intercorrelations in the 600 x 600 and the two 300 x 300 matrices were examined to determine whether the frequency of significant coefficients exceeded the numbers expected by chance. Table 3 presents distributions in percentage form of the frequencies of correlation coefficients, by magnitude, in the three basic matrices. As expected, the level of coefficients in all three matrices is low, but substantially higher for the Guilford than the Cattell items. In the Guilford matrix, 40 per cent of the coefficients are lower than .05 and 6 per cent are greater than .19, while in the Cattell matrix, the corresponding per cents are 50 and 3; the figures for the total matrix are in between. Despite the differences, the number of significant correlation coefficients in both source matrices exceeds chance expectation by a large margin. Nineteen per cent of the Cattell coefficients and 30 per cent of the Guilford coefficients (and 25 per cent of those in the total matrix) are at the level of .10 or higher.

Using the total 600 x 600 matrix, an analysis was made of the extent to which Guilford items correlated with each other and with Cattell items and vice versa. Table 4 shows the distributions for both source matrices of the numbers of items having correlations exceeding .09 in absolute value both within and across the two source matrices. It is clear from these distributions that there is both more communality among Guilford's than among Cattell's items and that indeed the Cattell items correlate more highly with Guilford items than they do with each other. For example, 131 Guilford items have 100 or more correlations greater than .09 with other Guilford items, while only 44 Cattell items have this many correlations in the same range with other Cattell items; at the low end of the scale, 72 Guilford items and 148 Cattell items have less

Table 4. Distributions showing the frequencies of Guilford and Cattell items with indicated numbers of correlations exceeding .09 within and across their respective source sets.

Number of Coefficients	Guilford Items With:		Cattell Items With:	
	G	C	G	C
180-189	1		2	
170-179	11		1	
160-169	17		9	
150-159	18	3	12	
140-149	12	7	11	5
130-139	20	14	11	6
120-129	16	18	13	15
110-119	12	15	11	6
100-109	24	13	13	12
90-99	16	18	19	13
80-89	16	27	11	23
70-79	13	21	20	15
60-69	23	21	17	28
50-59	29	30	22	29
40-49	20	31	22	29
30-39	18	24	17	40
20-29	15	30	30	28
10-19	11	18	21	29
0-9	8	10	38	22

than 50 correlations of .09 or higher within their respective matrices. In terms of correlations between matrices, 70 Guilford items have 100 or more correlations of .10 or higher with Cattell items, while 83 Cattell items have 100 or more such correlations with Guilford items; and 113 Guilford items have less than 50 correlations of .10 or higher with Cattell items, while 101 Cattell items have less than 50 such correlations with Guilford items.

From these two analyses we may conclude (a) that the correlation matrices have substantially more significant correlation coefficients than would be expected by chance, (b) that the Guilford item matrix is more highly intercorrelated than the Cattell item matrix, and (c) that the Cattell items correlate more highly with Guilford items than with each other.

The correlation matrices are not reproduced in this report, but are available on tape through the senior author.

FACTOR EXTRACTION AND ROTATION

Principal Factor Analysis of the Total Matrix

The total matrix of intercorrelations of the 600 items was factored by the Principal Factor Method and 23 factors were extracted. Table 5 summarizes information concerning these factors that was used to decide on the numbers of factors entered into rotation. These include for each factor, variance (sum of squared factor loadings), magnitude of the highest loading, average of the five highest loadings, and the per cent of residuals reaching or exceeding .10 in absolute value. After the first 15 factors, as shown in Table 5, the variances

Table 5. Unrotated factor results for the 600 x 600 matrix: data relevant to the number of factors to be entered into rotation.

Factor	Sum of squared loadings	Highest absolute loading	Average of five highest loadings	Per cent of residuals ≥ .10 in magnitude
1	41.73	.59	.58	5.7
2	20.18	.54	.49	2.4
3	13.86	.51	.47	1.1
4	11.07	.39	.36	.53
5	7.76	.38	.35	.32
6	6.13	.30	.29	.26
7	4.51	.28	.26	.22
8	4.10	.28	.25	.18
9	3.56	.27	.24	.16
10	3.33	.26	.24	.14
11	2.76	.22	.21	.12
12	2.51	.21	.20	.12
13	2.39	.25	.21	.11
14	2.16	.31	.24	.10
15	2.07	.21	.18	.09
16	1.99	.18	.17	.09
17	1.95	.20	.17	.08
18	1.94	.28	.24	.08
19	1.74	.19	.17	.08
20	1.73	.16	.15	.07
21	1.76	.20	.18	.07
22	1.62	.23	.21	.07
23	1.66	.23	.20	.06
Total	142.51			

were all under 2 and less than .1 per cent of the residuals reached or exceeded .10 in magnitude. Further, the highest loading on factor 16 was .18. Nevertheless, the variances for the next three factors, following factor 15, were close to 2 and an appreciable drop in variance occurred following the extraction of factor 18. At this point, an average of only 8 out of 10,000 residuals reached or exceeded .10 in magnitude. The exhaustion of the 600 x 600 matrix is also indicated in Table 6, which gives the frequency distributions of the original correlations and residuals after extraction of 15, 18, and 23 factors.

A corollary to the preceding results is to be seen in the distributions of the communalities of the 600 variables. The communality (sum of the squared loadings) for each variable was computed separately for 15, 18, and 23 factors. The distributions of these communality values, as shown in Table 7, reveal upward shifts with the extraction of additional numbers of factors.

In order to proceed most conservatively, in the light of the preceding results, it was decided to perform the rotations separately for the first 15 factors and the first 18. The results of these rotations, were next examined. Table 8 shows the variances for the four sets of rotated factors and Table 9, the coefficients of congruence between the correspondingly numbered Varimax and Promax factors for the two rotations. The latter table shows a high degree of similarity between the Varimax and Promax results in both rotations. At

Table 6. Frequency distributions of original and residual correlation coefficients in the 600x 600 matrix after extraction of 15, 18, and 23 factors.

Correlation Class Interval	Original		After 15 Factors		After 18 Factors		After 23 Factors	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Over .39	144	.08	3	.002	0	0	0	0
.35-.39	208	.12	3	.002	3	.002	0	0
.30-.34	525	.29	2	.001	4	.002	2	.001
.25-.29	1586	.88	5	.003	5	.003	5	.003
.20-.24	4268	2.38	10	.006	6	.003	8	.004
.15-.19	10542	5.87	44	.024	36	.020	23	.013
.10-.14	25188	14.02	99	.055	88	.049	78	.043
.05-.09	55199	30.72	2432	1.353	2001	1.114	1570	.874
0-.04	82040	45.65	177102	98.55	177557	98.807	178014	99.062

Table 7. Distribution of the communalities of the Guilford and Cattell variables for 15, 18, and 23 factors from the 600 x 600 matrix.

Communality Class Interval	15 Factors			18 Factors			23 Factors		
	G	C	Total	G	C	Total	G	C	Total
.00-.04	3	6	9	2	5	7	0	2	2
.05-.09	11	33	44	8	28	36	8	24	32
.10-.14	45	64	109	38	60	98	28	52	80
.15-.19	62	70	132	64	71	135	56	73	129
.20-.24	63	54	117	63	55	118	70	55	125
.25-.29	48	28	76	48	31	79	43	42	85
.30-.34	31	21	52	32	20	52	38	18	56
.35-.39	25	15	40	28	17	45	31	15	46
.40-.44	9	6	15	13	8	21	20	11	31
.45-.49	3	3	6	4	5	9	6	4	10
.50-.54	0	0	0	0	0	0	0	3	3
.55-.59	0	0	0	0	0	0	0	1	1

Table 8. Variances for Rotated Factors Extracted from the 600-Variable Matrix.

	18 Factors		15 Factors	
Factor	Varimax	Promax	Varimax	Promax
1	35.24	27.87	34.84	29.75
2	16.27	13.04	16.76	15.53
3	12.18	9.46	12.14	9.90
4	9.86	9.01	10.17	9.45
5	6.65	6.64	6.75	6.75
6	6.20	7.08	6.07	6.79
7	6.24	8.64	6.18	8.44
8	6.94	6.63	9.07	9.27
9	7.69	7.18	7.42	6.93
10	3.05	3.39	2.91	2.94
11	2.51	3.36	2.71	3.42
12	3.71	5.66	4.32	6.56
13	3.36	6.16	3.32	5.99
14	2.47	2.63	2.84	3.44
15	3.91	6.08	2.60	2.97
16	2.59	4.16		
17	2.82	4.29		
18	2.28	2.72		
Total Variance:	133.97	134.00	128.10	128.13

Table 9. Coefficients of congruence between the correspondingly numbered Varimax and Promax factors in the 18-factor and the 15-factor rotations.

Factor Pairs		18 Variable	15 Variable
1	1	.92	.94
2	2	.90	.94
3	3	.88	.89
4	4	.91	.93
5	5	.95	.96
6	6	.99	.98
7	7	.97	.98
8	8	.86	.90
9	9	.89	.90
10	10	.94	.97
11	11	.92	.97
12	12	.96	.99
13	13	.97	.94
14	14	.89	.97
15	15	.89	.97
16	16	.98	
17	17	.94	
18	18	.93	

the same time the concentration of variance in the first few factors is lower in the Promax than Varimax factors, as shown in Table 9.

Table 10 examines the congruence between the Varimax results for 18 and 15 factors, as well as between the corresponding Promax results. For the Varimax results, the coefficients of congruence for 11 of the first 12 factors are all above .9, while for the Promax results, coefficients of .9 or higher are approximated for all of the first 12 factors. Further, the correspondence pattern is good. The greatest resemblances after factor 12 are the same in both analyses, with only one reasonable additional match, that of factor 15 in the 18-variable rotation with factor 13 in the 15-variable rotation. Factors 13, 14, 16, 17, and 18 in the 18-variable rotation and 14 and 15 in the 15-variable rotation are not congruent with other factors across rotations.

For the 13 congruent factors, choice among 18-variable or 15-variable rotations by Varimax or Promax would appear to make little difference. Nevertheless, it was decided to use the item factor loadings of the 18-factor Promax rotation as the basis for factor interpretation. In support of this somewhat arbitrary decision, the following justification was considered. First, the interpretation of factors, in the final analysis, depends on their meaningfulness judged in terms of the patterns of item loadings; meaningful patterns might be observed on the smaller, later factors, even though not matched in the context of the parallel rotations, and they would be of interest. Second, the congruence analysis revealed 13 consistently appearing factors which might prove profitable to interpret; all of these could be estimated about

Table 10. Coefficients of congruence between Varimax and Promax factors in the 18-variable and 15-variable rotations.

Varimax Rotation			Promax Rotation		
18-var. factor	15-var factor	Coeff. of Congr.	18-var. factor	15-var. factor	Coeff. of Congr.
1	1	1.00	1	1	.97
2	2	1.00	2	2	.94
3	3	1.00	3	3	.98
4	4	.99	4	4	.97
5	5	1.00	5	5	.98
6	6	.92	6	6	.89
7	7	.99	7	7	.98
8	8	.97	8	8	.87
9	9	1.00	9	9	.99
10	10	.92	10	10	.91
11	11	.77	11	11	.92
12	12	.94	12	12	.94
13	14	-.53	13	14	-.43
14	15	.58	14	15	.45
15	13	-.84	15	13	-.85
16	11	.47	16	11	.35
17	15	.62	17	15	.47
18	15	-.50	18	15	-.45

equally well from any of the four analyses; however, the risk of omission of other possible meaningful factors could be avoided only by working with the larger set while at the same time no risk other than extra work would be incurred. Finally, the Promax loadings and congruence coefficients appeared subjectively to have a slight advantage over the Varimax in terms of consistency across analyses and distribution of variance among factors.

Principal Factor Analysis of the Two Source Matrices

In addition to factoring the total matrix, separate Principal Factor Analyses were completed of the 300 x 300 Guilford and Cattell item intercorrelation matrices. Twelve factors were extracted from the Guilford matrix and 11 factors from the Cattell matrix. The decisions concerning numbers of factors extracted were based on data presented in Tables 11 and 12 for the respective Guilford and Cattell matrices. The reasoning for cessation of factoring was similar to that discussed in conjunction with the total matrix, including consideration of the distributions of communalities, as shown in Table 13. The two sets of factors were rotated by Varimax and Promax methods and factor loadings for each analysis were estimated for the "other" set of items by the Dwyer extension. Congruences within and between factors in each of these analyses were estimated and, in addition, item-cluster correlation coefficients were computed between the empirical and source factors.

Although the variances of the rotated final factors extracted from the Guilford and Cattell matrices (Table 14) are greater than those of the rotated

Table 11. Unrotated factor results for the Cattell 300 x 300 matrix and residualized Guilford matrix: Data relevant to the cessation of factoring

Factor	Sum of squared loadings	Highest absolute loading	Average of five highest loadings	Per cent of residuals ≥ .10 in magnitude
Cattell				
1	17.61	.57	.53	5.3
2	9.20	.53	.44	2.6
3	6.88	.44	.39	1.3
4	6.01	.59	.52	.50
5	4.66	.41	.36	.22
6	3.10	.30	.26	.15
7	2.58	.28	.23	.13
8	2.13	.22	.21	.10
9	1.58	.34	.27	.08
10	1.52	.23	.20	.07
11	1.34	.32	.24	.07
Supplementary Guilford				
1	3.38	.45	.43	.36
2	1.99	.23	.22	.27
3	1.73	.23	.22	.24
4	1.54	.28	.22	.21
5	1.56	.18	.17	.19
6	1.42	.23	.23	.17
7	1.40	.22	.18	.15
8	1.31	.25	.22	.14

Table 12. Unrotated factor results for the Guilford 300 x 300 matrix and residualized Cattell matrix: Data relevant to the cessation of factoring

Factor	Sum of squared loadings	Highest absolute loading	Average of five highest loadings	Per cent of residuals ≥ .10 in magnitude
Guilford				
1	24.74	.58	.58	6.9
2	12.39	.48	.45	2.5
3	8.18	.53	.48	.92
4	4.48	.37	.34	.57
5	3.63	.32	.29	.43
6	3.09	.31	.27	.35
7	2.55	.25	.23	.28
8	2.15	.27	.25	.25
9	2.09	.31	.24	.21
10	1.64	.23	.20	.19
11	1.59	.25	.22	.17
12	1.42	.21	.19	.15
Supplementary Cattell				
1	3.21	.53	.51	.15
2	1.79	.24	.21	.10
3	1.61	.32	.23	.08
4	1.34	.30	.23	.07
5	1.33	.26	.23	.06
6	1.26	.43	.31	.06
7	1.20	.19	.17	.05

Table 13. Distribution of the communalities of the Guilford and Cattell Variables for the 12 factors from the Guilford matrix and the 11 factors from the Cattell matrix.

Communality Class Interval	12 Guilford Factors		11 Cattell Factors	
	G	C	G	C
.00-.04	4	13	3	6
.05-.09	16	61	31	41
.10-.14	48	80	66	66
.15-.19	63	62	71	70
.20-.24	61	43	70	51
.25-.29	41	18	28	28
.30-.34	33	13	21	21
.35-.39	21	7	10	11
.40-.44	10	3	0	2
.45-.49	3	0	0	3
.50-.54	0	0	0	1
.55-.59	0	0		

Table 14. Variances for Varimax and Promax rotations of 12 Guilford and 11 Cattell factors, showing portions, attirbuted to Guilford and Cattell items, for each.

Factor	Guilford Matrix						Cattell Matrix					
	Varimax Rotation			Promax Rotation			Varimax Rotation			Promax Rotation		
No.	G	C	Total	G	C	Total	G	C	Total	G	C	Total
1	20.98	13.79	34.77	18.28	11.59	29.87	21.12	13.96	35.08	20.51	13.00	33.51
2	7.54	8.08	15.61	6.96	8.27	15.24	9.20	8.94	18.15	8.72	8.47	17.19
3	9.08	3.64	12.72	7.99	2.20	10.19	5.52	6.53	12.05	5.34	6.15	11.49
4	4.27	5.66	9.92	4.45	5.81	10.26	2.82	5.93	8.75	2.70	5.84	8.54
5	3.30	2.36	5.66	3.79	2.59	6.39	4.90	4.52	9.42	4.71	4.44	9.15
6	5.22	2.90	8.11	4.63	2.36	6.99	3.30	3.17	6.47	3.90	3.75	7.66
7	5.61	3.00	8.61	5.08	2.50	7.58	4.03	3.11	7.14	4.87	3.50	8.37
8	2.75	2.59	5.34	3.94	3.86	7.80	2.09	4.24	6.33	2.01	4.62	6.63
9	2.43	2.14	4.57	3.23	2.91	6.14	1.27	1.83	3.10	1.45	2.22	3.66
10	2.40	2.17	4.57	3.27	3.03	6.30	1.28	2.47	3.75	1.15	2.67	3.82
11	1.90	.97	2.87	2.85	1.36	4.20	1.69	1.90	3.60	1.87	1.96	3.82
12	2.47	1.77	4.23	3.47	2.57	6.04						

final factors in the total matrix (Table 8) the tabulation of residual coefficients after extraction of 12 and 11 factors respectively from the two source matrices, in Table 15, leaves little doubt that further factorization is not indicated.

The data in Table 14 show the portions of variance in each rotated factor accounted for by Guilford and by Cattell items. Examination of this table suggests that the first two factors in both matrices have very similar variance contributions from the Guilford and Cattell item pools. Factor 1 in both rotations for each matrix is composed approximately 60 per cent of Guilford variance while factor 2 is about evenly divided between the two sources. The Guilford factor 3 is heavily weighted with Guilford variance, while the Cattell factor 4 is composed over two thirds of Cattell variance. Factor 4 in the Guilford matrix is divided about the same as factor 3 in the Cattell matrix; both are slightly heavier in Cattell variance. The remaining eight Guilford factors are weighted predominantly with Guilford variance, while only the final four Cattell factors have an excess of Cattell variance.

Table 16 compares the Varimax and Promax loading patterns of the two sets of factors in terms of coefficients of congruence. Here again the two are very similar; the coefficients are all over .9, except for Guilford factors 6 and 7, which are .89 and .88, respectively.

Principal Factor Analysis of the Residual Source Matrices

Residual matrices were developed by removing from the original Guilford matrix the variance accounted for by the 300 Cattell items and from the Cattell matrix the variance accounted for by the 300 Guilford items. The

Table 15. Frequency distributions of original correlations and residuals after extraction of 12 factors from Guilford matrix and 11 factors from Cattell matrix.

Correlation Class Interval	Guilford Matrix				Cattell Matrix			
	Original		Residual		Original		Residual	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Over .39	79	.18	0	0	21	.05	1	.002
.35-.39	123	.27	0	0	23	.05	1	.002
.30-.34	236	.53	0	0	77	.17	0	0
.25-.29	652	1.45	0	.002	253	.56	1	.002
.20-.24	1622	3.62	7	.02	695	1.55	2	.004
.15-.19	3497	7.80	14	.03	1954	4.36	5	.001
.10-.14	7303	16.28	46	.10	5415	12.07	20	.05
.05-.09	13551	30.21	701	1.56	13846	30.87	802	1.79
0-.04	17787	39.66	44081	98.29	22566	50.31	44018	98.15

Table 16. Coefficients of congruence between the correspondingly numbered Varimax and Promax factors in the Guilford 12-factor and Cattell 11-factor rotations.

Paired Factors	Guilford Matrix	Cattell Matrix
11	.95	.97
22	.94	.96
33	.90	.98
44	.97	.96
55	.95	.97
66	.89	.99
77	.88	.95
88	.98	.95
99	.97	.94
10 10	.98	.96
11 11	.95	.94
12 12	.99	

residual matrices were then composed of coefficients representative only of variance within the respective sets, and each could be considered as a source of supplementary factors independent of the other set. Eight supplementary Guilford and seven supplementary Cattell factors were extracted and rotated by Varimax and Promax methods.

Table 17 reports the factor variances of both rotated sets of factors and Table 18 shows the distributions of residuals before and after extracting the eight supplementary Guilford factors and the seven supplementary Cattell factors.

The largest variances in Table 17, for the first supplementary factors, are both smaller than the last original factor variances for the same source matrices in Table 14. However, the factors in Table 14 reflect substantial components from both sets of items, while those in Table 17 have only slight variance contributions from the "other" sets and are as "pure" reflections of their respective sets as the computational procedures could provide. As shown in Table 18, the residuals after extraction of the eight and seven factors from the two residual matrices indicate that further factoring would accomplish virtually nothing.

As in the earlier analyses, the congruence here between the Varimax and Promax factor loadings is high. Table 19 lists the congruence coefficients for both sets of factors and the lowest in either set is .96.

Table 17. Factor variances for Varimax and Promax rotations of 8 supplementary Guilford factors and 7 supplementary Cattell factors.

Factor	Guilford Factors						Cattell Factors					
	Varimax Rotation			Promax Rotation			Varimax Rotation			Promax Rotation		
No.	G	C	Total	G	C	Total	G	C	Total	G	C	Total
1	3.28	.52	3.80	3.22	.51	3.73	.61	2.98	3.59	.60	2.79	3.40
2	1.72	.62	2.34	1.70	.62	2.31	.61	1.63	2.24	.62	1.67	2.29
3	1.54	.55	2.09	1.56	.54	2.10	.54	1.51	2.05	.55	1.52	2.07
4	1.50	.54	2.04	1.52	.55	2.07	.53	1.36	1.89	.54	1.33	1.88
5	1.67	.51	2.18	1.69	.49	2.18	.47	1.36	1.83	.46	1.38	1.84
6	1.49	.56	2.05	1.51	.56	2.07	.47	1.32	1.79	.46	1.30	1.76
7	1.50	.61	2.11	1.52	.63	2.15	.51	1.57	2.08	.50	1.74	2.24
8	1.60	.70	2.30	1.59	.70	2.29						

TABLE 18. Frequency distributions of residuals before and after extraction of 8 supplementary Guilford factors and 7 supplementary Cattell factors from the residual source matrices.

Residual Class Interval	Supplementary Guilford Matrix				Supplementary Cattell Matrix			
	Before Factoring		After 8 factors		Before Factoring		After 7 factors	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Over .39	0	0	0	0	6	.013	1	.002
.35-.39	1	.022	0	0	0	0	0	0
.30-.34	5	.011	0	0	2	.004	1	.002
.25-.29	5	.011	1	.002	6	.013	0	0
.20-.24	32	.071	5	.011	18	.040	1	.002
.15-.19	71	.158	15	.033	24	.054	7	.016
.10-.14	161	.359	43	.096	121	.270	14	.031
.05-.09	1552	3.460	621	1.385	1522	3.394	707	1.576
0-.04	43023	95.926	44165	98.473	43151	96.212	44119	98.370

Table 19. Coefficients of congruence between the corresponding numbered Varimax and Promax factors in the supplementary Guilford and Cattell factor rotations.

Paired Factors	Guilford Residual Matrix	Cattell Residual Matrix
11	.99	.98
22	.98	1.00
33	.97	.99
44	.96	.96
55	.97	.97
66	.98	.97
77	.99	.98
88	.99	

FACTOR CONGRUENCES

Congruence Among Factors Within Matrices

Coefficients of congruence were computed among all rotated factors, Varimax and Promax, in all analyses. This section is concerned with congruence among factors in the same rotation. No significant congruences were observed and tables of these coefficients have been omitted from the present report.

Total matrix. For the 18-factor rotations of the 600 x 600 total matrix, the highest coefficient of congruence among the Varimax factors was -.51, between factors 1 and 8; the highest congruence coefficient in the Promax rotation was .47, between factors 4 and 10. The results for the 15-factor rotations were comparable, but the highest coefficients in both cases were lower than those observed in the 18-factor rotation.

Guilford and Cattell Source Matrices. For the 12-factor Guilford rotations, the highest congruence coefficients were -.57, between Varimax factors 1 and 7, and -.30, between Promax factors 5 and 11. The corresponding highest coefficients in the 11-factor Cattell rotations were .46, between Varimax factors 2 and 7, and .33, between Promax factors 7 and 9.

Supplementary Factors. The congruence coefficients among the supplementary factors were uniformly very low. In the rotations of the eight Guilford factors the highest were .12, between Varimax factors 3 and 4, and .24, between Promax factors 2 and 4. For the 7-factor Cattell rotations, the corresponding results were -.20 between Varimax factors 1 and 7, and .47, between Promax factors 4 and 5.

These data indicate substantial independence of all factors within the twelve matrices rotated.

Congruence Among Factors Across Matrices

From the voluminous tabular computer output, which is available on tape, some abridged summaries have been compiled to show the congruences observed among factors in the 18-, 15-, 12-, 11-, 8-, and 7-factor rotations. The relationship patterns among Varimax and Promax factors were very similar and for simplicity only the Promax results are presented. These appear in Tables 20, 21, and 22.

As noted earlier, reasonably good to excellent matches were obtained between the first 12 factors in the total matrix 18-factor and 15-factor rotations, as well as between factors 15 (18-factor) and 13 (15-factor). All of these have matches, at the level of congruence of .8 or higher, with at least one Guilford (12-factor) or Cattell (11-factor) factor. However, as shown in Table 20, additional moderate matches are indicated for three of the 18-factor factors (13, 14, and 17) which had no matches in the 15-factor Promax rotation. These data support the use of the 18-factor results for the total matrix.

Total Matrix. Factors 1 and 2, with the largest variances, of 28 and 13, respectively in the total matrix, are the same in the separate analyses of the Guilford and Cattell item matrices.

Table 20. Factors congruent with the 18 total matrix Promax factors. Summary of the Promax factors in five other matrices with greatest resemblance to these in terms of coefficients of congruence. Entries show factor number and congruence coefficient, in parentheses. Only congruences with a coefficients of .5 or higher are included.

Total Matrix 18 f.	Total Matrix 15 f.	Guilford Matrix 12 f.	Cattell Matrix 11 f.	Supplementary Guilford 8 f.	Matrices Cattell 7 f.
1	1 (.97)	1 (.95)	1 (.93)		
2	2 (.94)	2 (.90)	2 (.88)		
3	3 (.98)	3 (.97)	5 (.59)	1 (.93)	
4	4 (.97)	4 (.90)	3 (.74)		
5	5 (.98)		4 (.90)		1 (.91)
6	6 (.89)	5 (.58)	6 (.94)		
7	7 (.98)	8 (.63)	8 (.92)		2 (.71)
8	8 (.87)	7 (.89)		2 (.84)	
9	9 (.99)	6(-.95)	7 (.80)	3 (.61)	
10	10(.91)		10(.89)		3 (.74)
11	11(.92)		9 (.50)		
12	12(.94)	10(.88)	5 (.59)		4 (.65)
13		12(.77)			
14			11(.68)		
15	13(-.85)	9(-.81)			
16					
17				6 (.60)	
18					

Table 21. Factors congruent with the 12 Guilford Promax factors. Summary of the Promax factors in the 11-factor Cattell rotation and the Guilford and Cattell supplementary factor rotations with greatest resemblance in terms of coefficients of congruence. Entries show factor number and congruence coefficient, in parentheses. Only congruences with coefficients of .5 or higher are included.

Guilford Promax factor	Cattell Matrix	Supplementary Matrices	
		Guilford	Cattell*
	11 f.	11 f.	7 f.
1	1 (-.91)		
2	2 (.87)		
3	5 (.61)	1 (.87)	
4	3 (.81)		
5	6 (.54)		
6	7 (.75)	3 (.57)	
7		2 (.71)	
8	8 (.62)		
9			
10	4 (.51); 5 (.51)		
11		4 (.64)	
12			

* The highest congruence coefficient of any Guilford factor with a Cattell supplementary factor was .27.

Table 22. Factors congruent with the 11 Cattell Promax factors. Summary of Promax factors in the 12-factor Guilford rotation and the Guilford and Cattell supplementary factor rotations with greatest resemblance in terms of coefficients of congruence. Entries show factor number and congruence coefficient, in parentheses. Only congruences with coefficients of .5 or higher are included.

Cattell Promax Factor	Guilford Matrix 12 f.	Supplementary Matrices Guilford* 8 f.	Cattell 7 f.
1	1(-.91)		
2	2 (.87)		
3	4 (.81)		
4	10(.51); 3 (.61)		1 (.77)
5	10(.51)		
6	5 (.54)		
7	6 (.75)		
8	8 (.62)		2 (.67)
9			
10			3 (.78)
11			4 (.68)

* The highest congruence coefficient of any Cattell factor with a Guilford supplementary factor was .33.

Factor 3 in the total matrix appears as factor 3 in the Guilford matrix and as supplementary factor 1 in the Guilford residual matrix, but accounts for only minor variance in the Cattell matrix.

Factor 4 is primarily a Guilford factor; it is matched with Guilford factor 4 and moderately related to Cattell factor 3.

Factor 5 is a Cattell factor, having no match in the Guilford matrix, but with congruence coefficients over .9 with Cattell factor 4 and supplementary Cattell factor 1.

Factors 6 and 7 are primarily Cattell factors; 6 is matched with Cattell factor 6 and is only moderately related to Guilford factor 5; 7 is matched with Cattell factor 8 and is moderately related to Guilford factor 8 as well as supplementary Cattell factor 2.

Factors 8 and 9 are Guilford factors, although factor 9 has a moderate match also with Cattell factor 7. Factor 8 is a borderline match with Guilford factor 7 and supplementary Guilford factor 2. Factor 9 matches Guilford factor 6 and is moderately related to supplementary Guilford factor 3.

Factors 10 and 11 are primarily Cattell factors; 10 is a borderline match with Cattell factor 10 and supplementary Cattell factor 3, while 11 is moderately related to Cattell factor 9.

Factor 12 is related to both sources. It shows a borderline match with Guilford factor 10, and a moderate relation with Cattell factor 5 (also related to Guilford factor 3) and with supplementary Cattell factor 4.

Factor 13 shows a moderate relation with Guilford factor 12 and with none of the other groups, which Factor 14 is similarly related to Cattell factor 11.

Factor 15 is moderately related to Guilford factor 9 and factor 17, to supplementary Guilford factor 6.

These relationships can be summarized schematically as follows:

Factors matched in the Total Matrix (T), the Guilford Matrix (G), and the Cattell Matrix (C) (partial matches are underlined):

T 1	G 1	C 1	
T 2	G 2	C 2	
T 4	G 4	C 3	
T 7	G 8	C 8	C suppl. 2
T 9	G 6	C 7	G suppl. 3

Factors determined primarily by Guilford variance:

T 3	G 3		G suppl. 1
T 8	G 7		G suppl. 2
T 12	G 10		
T 13	G 12		
T 15	G 9		
T 17			G suppl. 6

Factors determined primarily by Cattell variance:

T 5		C 4	C suppl. 1
T 6		C 6	
T 10		C 10	C suppl. 3
T 11		C 9	
T 14		C 11	

Guilford and Cattell Matrices. The summary tables analyzing congruences among the Promax factors for the Guilford and Cattell matrices are numbers 21 and 22. Only factors 1 and 2 in these two sets of factors can be considered reasonably well matched although eight Guilford factors have coefficients of congruence of .5 or higher with eight Cattell factors.

Guilford factor 3 is moderately related to Cattell factor 5, as previously noted, but is well replicated by Guilford supplementary factor 1. This factor, which also appeared in the total matrix, is apparently unique to the Guilford item pool and only indirectly related to the Cattell items.

Guilford factors 4 and 6 have moderate matches with Cattell factors 3 and 7, as already observed. The Guilford factors that emerge in the supplementary factors are, as expected, those unrelated to the Cattell factors; Guilford factors 3, 7, and 11 are thus related to Guilford supplementary factors 1, 2, and 4, respectively. The nature of supplementary factor 3 will be interesting to examine, as it has a moderately high congruence with Guilford factor 6, which in turn has a congruence of .75 with Cattell factor 7.

Cattell factor 4 appears reasonably well in Cattell supplementary factor 1 and Cattell factor 10, in supplementary factor 3. The moderate relations between Cattell factor 8 and supplementary factor 2 and of Cattell factor 11 with supplementary factor 4 will also be interesting to explore in terms of item loadings.

VARIANCE DISTRIBUTION OF THE TOTAL MATRIX

Any discussion of the factor structure reported here should take into consideration the fact that the 18 Promax factors account for only 22 per cent of the total variance among the 600 items in the total matrix. The remaining variance is apparently distributed among a large number of minute residual factors and errors. Despite the low magnitude of the correlations in this matrix, however, the stability of the factor structure obtained in the several analyses described in this report is quite remarkable. This is attributed mainly to the large size of the sample employed.

Table 23 presents a breakdown of the variance estimates for the 18 Promax factors listed in Table 7, by source of variance. From this table it can be seen that Guilford items represent 54 per cent of the total accounted-for variance of 134.01, while Cattell items represent 46 per cent. The portions of variance attributed to Guilford and Cattell item sources, shown in Table 23, add information to the discussion of common and unique factors based on congruence analysis, in the preceding section. Thus, although factors 1, 2, 4, 7, and 9 are common to both sources, Table 23 shows that Guilford items have greater weight in 1 and 9, while Cattell items predominate in factors 2, 4, and 7.

Factors 3, 8, 12, 13, 15, and 17 were considered in the congruence analysis to be accounted for primarily by Guilford item variance. This appears to be supported by Table 23 only for factor 3, although the proportion

Table 23. Distribution of Variance Among the 18 Promax factors from the Total Matrix Among Guilford and Cattell sources .

Factor No.	Guilford Items	Cattell Items	Total
1	17.24	10.64	27.87
2	6.16	6.88	13.04
3	7.65	1.82	9.46
4	4.05	4.97	9.01
5	1.28	5.36	6.64
6	3.97	3.11	7.08
7	2.79	5.85	8.64
8	4.63	2.00	6.63
9	4.81	2.37	7.18
10	1.20	2.18	3.39
11	1.89	1.48	3.36
12	2.99	2.67	5.66
13	3.44	2.72	6.16
14	1.21	1.41	2.63
15	3.25	2.83	6.08
16	2.34	1.82	4.16
17	2.42	1.87	4.29
18	1.37	1.34	2.72
TOTAL	72.69	61.32	134.01

of Guilford item variance is higher than that of Cattell item variance for all six. However, the apparent discrepancy is not real; it occurs as a result of the accumulated miniscule contributions of large numbers of items, in the 600-item matrix, which have very low factor loadings, but whose effects can nevertheless be observed in the aggregate.

Factors 5, 6, 10, 11, and 14 were considered Cattell factors in the congruence analysis. This is clear only for factor 5, using the data of Table 23. However, the explanation offered in relation to the Guilford factors is believed to be the same here.

From Table 23 it is possible to tabulate the distribution of variance, by Guilford and Cattell sources, for the three groups of factors identified in the congruence analysis as common or unique to one or the other source. These results are shown in Table 24. By this estimate it appears that five factors (1, 2, 4, 7, and 9), representing approximately half of the accounted-for variance, are common to the two sources and contributed to by them in the proportions of 53 per cent, Guilford, and 47 per cent, Cattell.

Slightly over a fourth of the accounted-for variance is primarily represented by Guilford items, in factors 3, 8, 12, 13, 15, and 17. The variance analysis in Table 24 shows that 64 per cent of this variance is attributed to Guilford items and 36 per cent to Cattell items.

Seventeen per cent is principally Cattell variance, in factors 5, 6, 10, 11, and 14; this is assigned to the two sources in the proportion, Cattell 6, Guilford 4.

Table 24. Distribution of variance accounted for by 18 Promax factors (total matrix) among factors common to the Guilford and Cattell source items or unique to one or the other source.

Factor Group	Source of Variance					
	Guilford		Cattell		Total	
	var.	per cent	var.	per cent	var.	per cent
Factors common to both Guilford and Cattell items (factors 1, 2, 4, 7, 9)	35.05	53	30.71	47	65.76	49
Factors identified as primarily Guilford factors (factors 3, 8, 12, 13, 15, 17)	24.38	64	13.97	36	38.35	29
Factors identified as primarily Cattell factors (factors 5, 6, 10, 11, 14)	9.55	41	13.54	59	23.09	17
Remaining factors (factors 16, 18)	3.71	54	3.16	46	6.87	5

FACTOR IDENTIFICATION

Correlation of Empirical Factors With Source Factors

Up to this point the report has been concerned with derivation, classification, and relationships among factors in the six major analyses, without any attempt to identify them in terms of content. There is much to be said for this procedure, in relation to its objectivity and impartiality, and the first step in factor identification is also objective. This involves the computation of item cluster correlations between the empirical factors and the source factors, represented by clusters of items used as factor markers.

The item cluster correlations were computed with Varimax factors rather than Promax, since the Promax factor loadings are factor pattern coefficients rather than correlations with the factors. These were computed between the 15 Guilford and 17 Cattell source factors and the 12 Varimax and 8 supplementary Varimax empirical Guilford factors and the 11 Varimax and 7 supplementary Varimax empirical Cattell factors. A complete table of the 1216 correlations is available, along with the other source data of this report; the relevant results are summarized in Tables 25, 26, and 27.

Common Factors. Table 25 makes a number of consistent identifications with source factors for the five empirical factors found to be common to the factor structures of the two sources matrices, as well as to the total matrix.

Table 25. Salient correlations between empirical and source factors based on Varimax factors obtained independently from the Guilford and Cattell source matrices: correlations for congruent factors common to both sources.

Source Factors		Common Factors (Empirical)									
		G1	C1	G2	C2	G4	C3	G8	C8	G6	C7
Guilford	G									-.73	-.49
	A			.64	.72						
	M							.52			
	I	-.65	.56								
	N	.82	-.76								
	S			.82	.81						
	T										
	D	.83	-.74								
	C	.85	-.81								
	R										
	O	-.73	.78								
	Ag		.63								
	Co		.68								
	AA										
	CC					-.69	-.56				
Cattell	A			.53							
	C	-.70	.66								
	D	.61	-.61					-.31	-.45		
	E									-.31	
	F			.75	.75						
	G					-.63	-.72				
	H			.74	.82						
	I										
	J										
	L		-.50								
	M										
	N										
	O	.78	-.70								
	Q_1										
	Q_2										
	Q_3	-.61	.51								
	Q_4	.79	-.79								

Table 26. Salient correlations between empirical and source factors based on Varimax factors obtained independently from the Guilford and Cattell source matrices: correlations for factors identified as predominantly contributed by Guilford items.

Source Factors		Guilford Factors (Empirical)												
		G 3	G 7	G 9	G10	G12	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8
Guilford	G								.47					
	A													
	M											.37		
	I									.31				
	N													
	S													
	T				.44						.36			
	D													
	C													
	R			.42										
	O													
	Ag					.29								
	Co		.72						.43					
	AA	.95					.61							
	CC													
Cattell	A													
	C													
	D													
	E													
	F													
	G													
	H													
	I	.46												
	J													
	L		-.37											
	M													
	N													
	O													
	Q_1													
	Q_2													
	Q_3													
	Q_4													

Table 27. Salient correlations between empirical and source factors based on Varimax factors obtained independently from the Guilford and Cattell source matrices: correlations for factors identified as predominantly contributed by Cattell items.

		Cattell Factors (Empirical)											
Source Factors		C4	C6	C9	C10	C11	S1	S2	S3	S4	S5	S6	S7
Guilford	G												
	A												
	M	-.42											
	I												
	N												
	S												
	T												
	D												
	C												
	R												
	O												
	Ag												
	Co												
	AA												
	CC												
Cattell	A	.74					.51						-.30
	C												
	D												
	E												
	F												
	G												
	H												
	I	.61			-.38		.37						
	J												
	L												
	M												
	N												
	O												
	Q_1												
	Q_2												
	Q_3												
	Q_4												

Factors G 1 and C 1 have already been identified with T 1. The patterns of salient correlation coefficients in Table 25 identify Guilford source factors C, D, and N and Cattell source factors Q_4, O, and C as the principal sources of this factor. Additional related source factors are Guilford's I and O, with Ag and Co showing up in the Cattell matrix, and Cattell's D and Q_3, with L showing in the Cattell matrix. In this and later factors, to be discussed, the significance of the contributions of various source factors must be evaluated in terms of loadings of specific items. In the content analysis, reported in the introductory portion of this report, mention was made both of similarities among items represented as markers for different factors and of variations in content among items in various factor groupings. In the present reference, the presence in a factor pattern of highly loaded items with different source factor labels would be interpreted as purturbing if the items were unrelated in content to the central core, but as reflecting mainly on the source if the items were homogeneous with the core.

Factors G 2 and C 2, identified with T 2, appear to be composed of Guilford source factors S and A and Cattell source factors H and F. Cattell factor A also shows a moderate loading in the Guilford matrix.

Factors G 4 and C 3, identified with T 4, have salient patterns on Guilford's CC and Cattell's G.

The two remaining common factors are not as clearly identified in this analysis. Factor G 8 was imperfectly matched with C 8 and T 7 in the congruence analysis, but included in the hope that this would encourage identification. In Table 25, G 8 has a low correlation with Cattell's D in the Guilford matrix and a somewhat higher correlation with D in the Cattell matrix. Guilford's M appears with a loading on G 8, but not on C 8.

Factor C 7 was mentioned as an imperfect match with G 6 and T 9 in the congruence analysis and this is reflected in the salient correlations in Table 25, where G 6 has a correlation of -.73 with Guilford's G and C 7, -.49. The loading of Cattell's E of -.31 on G 6 is not replicated on C 7.

Guilford Factors. Factors G 3, G 7, G 9, G 10, and G 12 were identified in the congruence analysis as determined principally by variance associated with Guilford items. The most important of these, in terms of variance accounted for, is Factor G 3, which has a correlation of .95 with Guilford source factor AA and which also carries out as Guilford supplementary factor 1. Source factor AA dominates factor 3 in the total matrix (factor T 3) and is based on items relating to interests in literature, drama, and the arts which are quite different from other items in both item pools. This factor had a congruence coefficient of .61 with Cattell factor C 5, which correlates .49 with it. G 3 has a correlation of .49 with Cattell source factor 1. The highest correlations found for Cattell factor C 5 are .44 with Q_1 and .42 with Q_2.

Factor G 7, identified with T 8, has a correlation of .72 with Guilford source factor Co, which also correlates .43 with Guilford S 2. None of the other correlations in Table 26 is high, but the salient correlations, of G 9 with R, G 10 and S 5 with T, G 12 with Ag, S 3 with G, S 4 with I, and S 6 with M, are useful in focusing the examination of item loadings, discussed below.

Cattell Factors. Only two of the five factors identified as principally accounted for by Cattell items in the congruence analysis have salient correlations listed in Table 27. These are C 4, identified with T 5 and Cattell S 1, which has correlations of .71 with Cattell source factor A, .61 with Cattell I, and -.42 with Guilford's M. Factor C 10 is also slightly correlated with I, -.38. Supplementary Cattell factor S 1 has a similar loading pattern to that of C 4; in addition to a correlation of .51 with A, it has a correlation of .37 with I. Cattell factor S 7 also has a correlation of -.30 with A.

Examination of Items with Salient Loadings

Factor T 1 G 1 C 1. This first and largest factor in the Total, Guilford, and Cattell matrices has been identified as related to Guilford source factors C, D, and N and Cattell source factors Q_4, O, and C. However, the first 50 item loadings, ranging from .74 to .39, represent 8 Guilford and 7 Cattell source factors. A tabulation of the content of these 50 items is presented to support the argument that they form a content-homogeneous, although source factor-heterogeneous (with respect to both sources) core that makes good psychological sense. This is as follows:

Guilford Items (34, representing factors C, D, N, T, I, S, O, R)

C Items (numbered according to Appendix B) 454, 455, 457, 461, 469, 470, 471, 472

mood swing (454, 455), easily rattled (457), sleep disturbance-perseveration, mind wanders, frequently absentminded, day dreams (461, 469, 470, 471, 472)

D Items 440, 441, 444, 445, 448, 449, 450, 452, 453

low spirits (440), miserable (441), worry (444), sleep disturbance-worry (445), loneliness (448, 449), listless-tired (450), troubled by guilt (452), unworthiness (453)

N Items 390, 392, 396, 401, 402, 406, 407

tension (390), sleep disturbance (392), fidgeting (396), takes medicine to quiet nerves (401), irritated, annoyed (402), tired, listless (406, 407)

T Items 429, 432

meditative state (429), lost in thought (432)

I Items 377, 386, 388

felt inferiority (377), afraid of not being liked by others (386), concern with approval of others (388)

S Items 414, 416

troubled by self-consciousness (414), uneasy with others present (416)

O Items 495, 501

egocentricism (495), feelings easily hurt (501)

R Item 482

overconscientious

Cattell Items (16, representing factors Q_4, O, C, H, M, N, Q_3)

$\underline{Q_4}$ Items 285, 289, 293, 294, 298, 299

easily distracted in some moods (285), strong emotional moods without cause (289), tension, turmoil (293), excessive irritation by small setbacks (294), tired when getting up in morning (298), perseveration, thoughts stray through mind (299)

O Items 221, 233, 235

feelings of loneliness and unworthiness in groups (221), sleep disturbance, worry (233), feeling of not being needed by friends (235)

C Items 28, 37

emotional satisfaction (28), vivid dreams, sleep disturbance (37)

H Item 120

inferiority in social relations

M Item 194

considered absentminded and impractical by friends

N Item 217

fears happiness cannot last

$\underline{Q_3}$ Items 276, 279

tends to get overexcited and rattled (276), actions swayed by jealousy (279)

Taken together, these 50 items represent three related themes: (a) tension, reflected by items concerned with being rattled, distracted, tense, irritated, and annoyed; (b) depression, worry, anxiety, expressed by items involving low spirits, loneliness, feeling miserable, worry, and

(c) perseveration of ideas, fantasy, from items dealing with mind wandering, day dreaming, thought perseveration, and sleep disturbance associated with perseveration and worry.

Although three Guilford source factors (C, D, N) account for 23 of the 34 salient Guilford items among the first 50 (67 per cent) and three Cattell source factors (Q_4 O, C) account for 11 of the 16 salient Cattell items (70 per cent) among this group, examination of item content suggests strongly that there is considerably greater item homogeneity than the source-factor labels on the 11 additional Guilford items and the 5 additional Cattell items might imply.

It must be acknowledged that judgments of content homogeneity are subjective and that they may vary with the purposes for which efforts to classify are undertaken. To a lexicographer, subtle shades of connotative or denotative difference might be significant, while a psychologist seeking structure among factor-analytic results might be motivated to group items that occupy discrete positions in the dictionary. Our position at present is that factor-analytic results are not invariant across population samples and that the psychologist should be guided by the item factor loadings toward understanding the meanings of words and questions evidenced by samples of subjects in their patterns of response. The interpretations attempted in this section are presented as openly and completely as possible in order to assist the critical reader to evaluate their objectivity and reasonableness.

The interpretation of this factor, based on the first 50 salient items in order of factor loading (from .74 to .39), changes only slightly when the next 37 items, with loadings ranging from .39 to .30, are examined. Table 28 compares the distribution of salient items by source factor among the first 50 items and the next 37. The predominant source contributors are underlined, namely three Guilford factors C, D, N, with lesser contributions from I and O, and Cattell factors Q_4, O, and C, with a lesser contribution from Q_3. Guilford's D and Cattell's Q_4 drop significantly in influence from the first 50 to the next 37 items in order of loading. Nevertheless, the impression obtained is that the consistency of content among the salients, even down to factor loadings of .30, is impressive.

Since the major sources of this factor are factors entitled C-Cycloid Personality, D-Depression, N-Nervousness, Q_4-Ergic Tension, O-Guilt Proneness, and C-Ego Strength, a title for factor T 1 G 1 C 1 should reflect these emphases, which are central to the interpretation offered, based on item content. The title selected is EMOTIONAL STABILITY, which appears to embrace the complete range of meaning represented. This title has two additional advantages: (1) It is neutral in the sense that it does not overlap any of the Guilford or Cattell titles; and (2) It coincides with the title of a closely related factor, based on trait ratings, reported by Norman (1963) and Tupes and Christal (1961) in other factor-analytic personality studies using Air Force recruits as subjects.

Table 28. Distributions of salient items on factor T1 G1 C1 by source factor, comparing distribution for first 50 items (loading range, .79 to .39) with that for the next 37 items (loading range, .39 to .30). Loadings based on 18-factor Promax rotation.

Source Factors		First 50 items	Next 37 items	Combined, 87 items
Guilford factors:	G		1	1
	A			
	M		1	1
	I	3	2	5
	N	7	4	11
	S	2		2
	T	2		2
	D	9	1	10
	C	8	7	15
	R	1	2	3
	O	2	3	5
	Ag			
	Co			
	AA			
	CC			
Cattell factors:	A			
	C	2	4	6
	D		1	1
	E			
	F			
	G		1	1
	H	1		1
	I			
	J			
	L			
	M	1		1
	N	1		1
	O	3	4	7
	Q_1		1	1
	Q_2		1	1
	Q_3	2	2	4
	Q_4	6	2	8

Factor T 2 G 2 C 2. This factor emerged second in order and in variance in all three major analyses. The correlational analysis has identified it with Guilford source factors S and A and with Cattell source factors F and H. However, as shown in Table 29, six Guilford source factors and six Cattell source factors are represented among the 73 most salient items, with factor loadings in the range from .67 to .21. The distributions of salient items by source factor confirm S, A, F, and H as the predominant sources, but with the exception of one item with a very high loading (Item 330, factor loading .65; second highest on factor) Guilford factor A is less important than the other three in terms of number of salient items. In this factor, as in the first, the homogeneity of content among salient items appears high, despite the heterogeneity of factor labels. This is illustrated in the following summary of the first 43 items, with loadings ranging from .67 (Item 90 - Cattell factor F) to .30.

Guilford Items (20, representing factors S, A, R, G, and M)

S Items (numbered according to Appendix B) 409, 410, 411, 412, 413, 418, 419, 420, 422, 423, 424, 425, 427, 428

ease of making acquaintances, friends (409, 410), leader in social groups, life of the party (411, 412), follower or leader (413), enjoyment of limelight (418, 419), shy, bashful vs. venturesome in social, mixed group situations (420, 422, 423), avoids people (424), enjoyment of social activity, entertainment of others (425, 427, 428)

A Items 328, 330

enjoys taking initiative to liven up a dull party (330), used initiative to organize a club (328)

Tabel 29. Distributions of salient items on factor T 2 G 2 C 2 by source factor, comparing distribution for first 43 items (loading range, .67 to .30) with that for the next 30 items (loading range, .30 to .21). Loadings based on 18-factor Promax rotation.

Source Factors		First 43 items	Next 30 items	Combined, 73 items
Guilford factors:	G	1		1
	A	2	5	7
	M	1	1	2
	I		1	1
	N			
	S	14	5	19
	T			
	D			
	C			
	R	2	2	4
	O			
	Ag			
	Co			
	AA			
	CC			
Cattell factors:	A	1	4	5
	C			
	D			
	E			
	F	9	4	13
	G			
	H	9	5	14
	I			
	J	2	1	3
	L			
	M			
	N			
	O		1	1
	Q_1			
	Q_2	2	1	3
	Q_3			
	Q_4			

R Items 478, 477, 487

shows "rah-rah" enthusiasm (487), views self as happy-go-lucky (478), prefers slapstick comedy to serious drama (477)

G Item 312

tolerance of inactivity when staying at home

M Item 354

preference for going dancing over a prize fight

Cattell Items (23, representing factors F, H, J, Q_2, A)

F Items 81, 83, 84, 85, 87, 89, 90, 91, 97

enjoys excitement and bustle (81), attendance and enjoyment of social functions (83, 84, 85), tells stories, jokes (87), happy-go-lucky (89), social initiative (90), numbers of friendships (91), ease vs. awkwardness in groups (97)

H Items 117, 118, 119, 121, 122, 123, 124, 126, 134

openness vs. reserve with opposite sex (117, 118), outgoing vs. inhibited (119, 121), easy vs. shy, careful in conversing or speaking with strangers, in groups, making friends (122, 123, 124), ease at being center of attention (126), number of friends (134)

J Items 163, 166

interaction vs. isolation in group situations

Q_2 Items 261, 264

interacted with opposite sex as teenager (261), is sought out for comfort and advice (264)

A Item 10

preference for resort over quiet cottage for vacation

The most common themes among the salient items of this factor involve social initiative, ease, skill, and enjoyment of social interaction, including interaction with the opposite sex, enjoyment of the limelight, having and making friends; outgoing behavior, happy-go-lucky mood, and enthusiasm fit in naturally with this pattern.

An appropriate title for this factor, which relates to the nature of the principal defining source traits, S-Sociability, A-Ascendance vs. Submissiveness, H-Shy, Restrained vs. Venturesome, Bold, and F-Surgency vs. Desurgency, is SOCIAL EXTRAVERSION. This factor is related to Norman's (1963) peer rating factor of Extroversion or Surgency, although the social context, as emphasized here, is not as explicit in the rating factors used by Norman.

Factor T3 G3 G-S1. This factor, which is clearly defined by Guilford's source factor AA, reflects salient loadings from other Guilford source factors and from Cattell source factors only to the extent that they involve content concerned with sculpture, painting, music, drama, literature, poetry, and other arts or artisitc preferences. In the 18-factor Promax rotation, 34 items have loadings on this factor between .70 and .20. The first 19, down to a factor loading of .40, are all AA items; the twentieth follows a Guilford M item (351) which involves interest in participation in dramatics, and a Cattell Q_2 item (267) in which reading preference concerning Indian murders is tested against that involving

Indian paintings. The last 12 items in the list of salients, includes 3 Guilford M items contrasting arts with masculine preferences for business, science, and athletics, one Guilford R item, and one Guilford T item, as well as three Cattell I items emphasizing aesthetic sensitivity, and one each from A, N, Q_1, and Q_3. In this latter group, thoughtfulness, polish, sophistication, and philosophy are associated with the artistic core.

This factor is unmistakeably Guilford's ARTISTIC INTEREST factor, reproduced intact in the Total and Guilford matrices and in the residual Guilford matrix as supplementary factor 1, after variance attributable to Cattell items was removed. The hypothesis that this factor might be related to Cattell's M or N is not supported. The loadings of I and N appear to be ordered by the almost literal dependence on artistic content rather than on secondary tendencies that may be theoretically compatible with an abstract concept of an artistic personality.

Factor T4 G4 C3. The correlational analysis related this factor to Guilford source factor CC and Cattell's factor G. Nevertheless, among the first 31 salient items, with loadings from .78 to .30, there are four Guilford M items, three Cattell E items, and one or two from Cattell's C, F, I, M, N, and Q_1. Distributions of factor loadings by source factor for the 67 items with loadings of .20 or higher are shown in Table 30 for 31 salients in the loading range of .78 to .30 and for 38 additional items in the range, .29 to .20.

Table 30. Distributions of salient items on factor T4 G4 C3 by source factor, comparing distribution for first 31 items (loading range, .78 to .30) with that for the next 36 items (loading range, .29 to .20). Loadings based on 18-factor Promax rotation.

Source Factors		First 31 items	Next 38 items	Combined, 69 items
Guilford factors:	G			
	A			
	M	4	3	7
	I			
	N			
	S			
	T			
	D			
	C			
	R		1	1
	O			
	Ag			
	Co			
	AA			
	CC	9	8	17
Cattell factors:	A			
	C	1	2	3
	D			
	E	3	2	5
	F	1	2	3
	G	7	5	12
	H		1	1
	I	2	4	6
	J			
	L		1	1
	M	1	1	2
	N	2	3	5
	O			
	Q_1	1		1
	Q_2			
	Q_3		3	3
	Q_4			

The following enumeration of item content clearly shows that the Guilford R item and 8 M items loaded on this factor, as well as the scattering of Cattell items from nine Cattell factors other than G, are related meaningfully to the core of CC and G items on a dimension of cultural conformity, morality, and superego function.

Guilford Items (25, representing factors CC, M, R)

CC Items (numbered according to Appendix B) 576, 577, 578, 579, 581, 582, 584, 585, 586, 587, 588, 590, 595, 596, 598, 599, 600

moral standards, respect for right and wrong, standards of conduct (576, 578, 582, 584, 585, 587), duty to society (586), manners, etiquette (579, 590), parental discipline (595, 596), idealism, desire to improve the world (577, 598, 599), political conservatism (581, 588, 600)

M Items 348, 357, 358, 359, 360, 361, 364

preference to be dress designer over forest ranger (348), disgust at socially objectionable displays: dirty fingernails, perspiration odors, pus, foul language, unshaven man (357-361 incl.), feel sorry for a bird with a broken wing (364)

R Item 476

subscribe to philosophy of live for today

Cattell Items (42, representing factors G, C, E, F, H, I, L, M, N, Q_1, Q_3)

G Items 99, 102, 103, 105, 106, 107, 109, 110, 111, 112, 115, 116

responsibility, carefulness in work and with property, avoidance of waste (102, 103, 105), moral duty, right vs. wrong (106, 107, 109, 110, 111, 112), good manners, respect for rules (99), dislike disorder (115), taking things seriously (116)

C Items 33, 39, 40

disgust at untidyness (33), respect for parents (39, 40)

E Items 64, 73, 74, 75, 76

avoid embarrassing people (64), embarrassment, disapproval of nonconformist, deviant behavior: bragging about superiority, telling lies, use of foul language, vacation at nudist camp (73, 74, 75, 76)

F Items 86, 88, 96

social conformity, reputation for enthusiasm (86), disapproval of nonconformist behavior: sex topics with opposite sex, telling bold-faced lies (88, 96)

H Item 122

enjoy speaking to a stranger

I Items 140, 141, 142, 146, 150, 153

good manners, in laughing at jokes (140), preference for religious alternative in choice of books, occupation (141, 142, 146), neatness, orderliness (150), time to think seriously (153)

L Item 188

careful planning to achieve goals

M Items 196, 202

seeking artistic and spiritual truths (196), stricter Sabbath observance vs. greater freedom in regard to divorce (202)

N Items 207, 209, 215, 216, 220

preference for polite people (207), good taste on moral issues, serious moral purpose (209, 215), embarrassed to be waited on by servants (216), respect for parental authority (220)

Q_1 Item 241

sanctity of religious authority

Q_3 Items 272, 274, 278

perseverance overcomes obstacles, carefulness avoids accidents (272, 274), preference to watch artist than a quarrel (278)

The central themes of this factor are very close to a term that was used by Norman (1963) for a replicated rating factor and is adopted here as expressive of their essence. This is CONSCIENTIOUSNESS, which is intrinsic to the ideas of religious, moral standards and observance, use of discipline, propriety, respect for authority, conformity with social norms, rules, and niceties, respect for hard work and serious thinking.

Several items included in the preceding listing are difficult to interpret. These are Guilford M-348, preference to be a dress designer over a forest ranger, Guilford M-364, feel sorry for a bird with a broken wing, Cattell H-122, enjoy speaking to a stranger, and Q_3-278, preference to watch an artist rather than listen to a quarrel. These four items have factor loadings in the range of .20 to .23. Whether or not rationalizations for their inclusion can be offered, they still represent only four of 67 salient items that define this factor quite well.

Factor T5 C4 C-S1. Both the congruence and the correlation analyses identified this as a Cattell factor, correlating with Cattell source factors A and I; however, the correlation analysis also revealed a negative correlation of -.42 with Guilford's M. The first 32 salient items, with factor loadings ranging from .69 to .20, include 11 A items, 6 I items, and 8 Guilford M items. The remaining 7 items in this list are distributed as follows: Cattell F-2, N-2, M-1, J-1, and Guilford AA-1. The rank order of the 11 A items is 11 and for the first 10 it is 9.5. The rank order of the six I items is 10.5 and for the first five of these it is 5.6. The rank order of the eight Guilford M items is 23. The loadings of all eight M items are negative. Among the 12 most highly loaded items, all exceeding .40, six are A and 5 are I; the remaining item is a Cattell F, with a loading of .41.

Cattell's factor A is described in terms of reserved-cool vs. outgoing, warm and was scored in the "out going" direction, while his factor I is described in terms of tough vs. tender attitudes and is scored in the "tender" direction. The negative loadings on Guilford's M - Masculinity are consistent with this pattern. The content of the 32 items, by source factor, is listed below.

Guilford Items (9, representing 8 M items and one AA item)

M Items 345, 346, 347, 348, 349, 351, 353, 355

vocational preferences: architect over librarian (345), miner over florist (346), building contractor over fashion designer (347), forest ranger over dress designer (348), explorer of new territory over librarian (349); activity preferences: dislike of participating in dramatics (351), liking to hunt wild game (353), study of science and mathematics over literature and music (355)

AA Item 571

dislike making a comparative study of architectural styles

Cattell Items (23, representing factors A, I, F, J, M, N)

A Items 1, 2, 3, 4, 5, 6, 7, 8, 16, 17, 19

vocational preferences: grammar or high school teacher over forester (1), lawyer over navigator or pilot (2), interviewing and hiring people in a factory over taking charge of mechanical matters (3), being a hotel manager over a research chemist (4), being a business office manager over an architect (5), an insurance salesman over a farmer (6), talking to and hiring people in a factory over being in charge of machinery or records (with equal pay) (7), organizing and seeing people in a business office over being an architect, drawing plans in a back room (8), waiter over carpenter or cook (with equal hours) (16); activity preferences for supervising childrens games over helping a watchmaker (17), being secretary of a social club over the life of an artist (19)

I Items 143, 144, 145, 147, 148, 149

vocational preferences for: teacher of social studies over construction engineer (143), teacher of social ideas and manners over construction engineer (147), writing and editing childrens books over repairing electrical machines (148), being a guidance worker with young people seeking careers over manager in a technical manufacturing concern (149); school preferences, of English over mathematics and arithmetic (145), and music over handcrafts and arts (144)

F Items 95, 96

vocational preferences for: actor over house builder (95), advertising man and promoter over master printer (96)

I Item 167

preference for running a class picnic, in the woods, over knowing all the trees

M Item 201

vocational preference, to be a public accountant or insurance man over an artist or naturalist

N Items 212, 218

dislike for routine construction work, using a good piece of machinery or apparatus (212), preference to work as a probation officer, with criminals on parole

The response patterning reflected by the salient items on this factor appears to fit the descriptive language of Cattell's factor A very closely, while the statistical indications implicating I (tender vs. tough minded) and M (masculinity) are viewed as oblique to the main dimension of warmhearted, attentive to people, cooperative, expressive vs. reserved, secretive, impersonal, cool (cyclothymia vs. schizothymia). Although the polarities of masculine vs. feminine and tough vs. tender often coincide with the outgoing vs. withdrawn dimension, as in the many items on which the outgoing choice is also feminine and tender, in contrast to the alternative given in the item question, the choices given in most of the items salient on this factor are more typically oriented to attentiveness to people than to femininity. Indeed, only six of 19 I items and eight of 30 M items are salient on this factor. Following this reasoning, factor T5 C4 C-S1 is regarded as a dimension of CYCLOTHYMIA vs. SCHIZOTHYMIA, in accordance with Cattell's description. The masculinity and tender-tough correlates must be noted, however, as deserving of further study to determine the extent to which they may be viewed as intrinsic rather than as an unintended consequence of item construction. It is of interest that this factor does not appear among those listed by Norman (1963) as replicated in trait rating studies, although the results of the present study add weight to Cattell's claims with regard to it.

Factor T6 C6. This is a very interesting factor, which appears in the Total and Cattell matrices in highly similar form, but is not reflected in any of the supplementary Cattell factors and has no substantial correlation with any of the source factors in either source group. The 39 items with highest Promax loadings, ranging from .38 to .20, represent ten Guilford factors and 9 Cattell factors; of these the highest representation is from

Guilford factor Co, with seven items, although three Cattell G items have high loadings within the range obtained. Despite the apparent lack of structure, however, based on the objective, statistical evidence, examination of the salient items does show a consistent content theme of generalized hostility vs. agreeableness and acceptance quite similar to Norman's trait of Agreeableness, defined by the following polarities: goodnatured vs. irritable; not jealous vs. jealous; mild, gentle vs. headstrong; and cooperative vs. negativistic. The extent to which these ideas appear among the salient items, drawn from the 19 source factors contributing one or more items, can be judged from the following tabulation.

Guilford Items (24, representing factors G, M, I, D, R, O, Ag, Co, AA, CC)

G Item 311

restless when work involves little action

M Item 349

preference to be explorer of new territory over a librarian

I Items 371, 372

feelings of adequacy regarding: always knowing what to do next (371), and believing that family and friends believe in "me" (372)

D Items 440, 443, 447

rejection of emotional depression: not frequently in low spirits (440), does not feel that there are few things worth living for (443), not usually in good spirits (447)

R Item 476

carefree, subscribes to "eat, drink, be merry, etc."

O Item 504

ideas of reference (other people say or do things to annoy me)

Ag Items 510, 517

contempt of persons who "turn the other check" (510), hostility toward rude persons (517)

Co Items 532, 547, 549, 550, 551, 553, 555

faultfinding with courts of law (532), suspicion of people who exaggerate their troubles (547); suspicion of attention received from others (549), of people who "talk behind my back" (550), and those who "make it hard for me" (551); victim of hard luck (553, 555)

CC Items 577, 579, 588, 592, 598

strong desire to improve world (577), conformity to rules of etiquette (579), hostility toward radical politicians (588), competitiveness (592), no-nonsense attitude about need for art to convey a serious message (598)

AA Item 557

dislike of reading about the theater

Cattell Items (15, representing factors C, D, E, G, I, N, O, Q_1, Q_2)

C Item 26

resistance to change

D Item 52

resentment of senior people on the job

E Item 66

disregard for authority (tearing down restrictive public notice)

G Items 98, 101, 108

admiration of a clever but undependable man (98), cynicism about pleasing the right people being more important than good work (101), importance of freedom over good manners and respect for law (108)

N Items 208, 219

preference of "down-to-earth" people over those who are sophisticated and polished (208), advocates expenditures for education over arms (219)

O Item 227

pessimism in face of difficulties

Q_1 Item 242

disregard for "the wisdom of the past"

Q_2 Items 256, 265, 266

high self-confidence (256), disapproval of rights of parents to prevent vaccination of children for sentimental reasons (265), distrust of statistics and reference books in relation to social issues (266)

In view of the resemblance of this factor to the descriptive core of the similar factor reported by Norman (1963), it has been assigned the title, AGREEABLENESS vs. HOSTILITY. Whether or not this is principally a Cattell factor, as suggested by the preliminary congruence analysis, is regarded as of minor interest, since the decision would be determined by the accumulation of small loadings across the entire list of items. The analysis based on the 39 salient items draws slightly more from Guilford items than Cattell items. However, these 39 items represent 19 source factors, almost equally distributed. On this basis, this factor could properly be regarded as common to the two sources.

Factor T 7 G 8 C 8 C-S 2. Although identified principally with variance associated with Cattell items in the congruence and correlational analyses, this was treated provisionally as a factor common to both sources, with major representation in T 7 and C 8 and moderate representation in G 8 and C-S 2. The major source factors involved, according to Table 25, are Cattell's D, with a negative sign, and Guilford's M, with G 8, but not with C 8.

Of the 44 most highly loaded items, ranging from .54 to .23, 31 are Cattell items and 13, Guilford items. Twenty-two of the first 25 highest loadings are on Cattell items, while eight of the last ten are Guilford items. On this basis, the salience of Cattell source variance is apparent.

The 31 salient Cattell items represent 10 source factors, with the highest frequencies from D (9 items) and L (5 items). None of the Guilford source factors contributed more than three salient items, although seven factors have at least one item in the group. The prominence of Cattell D and L items among the salient markers of this factor was the basis for a provisional hypothesis that trusting, adaptable orientations vs. excitability and suspiciousness are involved. It is necessary to distinguish this factor clearly from T 6. The hypothesis is that the present factor reflects an almost "Pollyannaish" acceptance of annoyances, at the high pole, and excited, almost paranoid suspicion, at the low pole, while T 6 reflects agreeable, cooperative vs. cynical, hostile attitudes. The focus of the salient items is illustrated in the following item tabulation.

Guilford Items (13, representing factors M, N, D, C, R, O, Ag)

M	Items 358, 359
	not disgusted at perspiration odors and pus
N	Items 400, 402
	not irritated at continued noises, little annoyances
D	Item 446
	cheerfulness in spite of troubles
C	Items 465, 466
	not resentful when prevented from having own way or when losing in competition
R	Item 478
	self rating as happy-go-lucky
O	Items 500, 501
	not resentful of criticism, feelings not easily hurt
Ag	Items 508, 516, 519
	not irritated with "shrinking violet" type of man (508), not resentful of being told what to do (516), or of "nosy" people (519)

Cattell Items (31, representing factors C, D, F, H, J, L, M, O, Q_3, Q_4)

C	Items 26, 29, 33
	is able to change old habits (26), not annoyed or resentful at unreasonable people (29), or at sloppy, untidy people (33)

D Items 41, 42, 43, 44, 45, 47, 49, 50, 59

smiles when things go wrong (41), seldom gets angry when things go wrong (42), keeps calm when breaking or wasting things (43), accepts being left out by friends as a mistake (44), stays quiet and smiles when someone gets angry and smiles (45), can work hard on something without being bothered (47), not annoyed if people are noisy when listening to radio (49), tries to concentrate if people chatter while music is on (50), would still be satisfied if never elected to a club office (59)

F Item 89

self description as happy-go-lucky, nonchalant

H Item 130

always more concerned to enjoy, even an important game, than to win

I Items 155, 158, 160

enjoys being object of a joke (155), soon trusts persons who have been unkind (158), easy to forget unfair treatment (160)

L Items 175, 176, 177, 180, 181

can easily forget own awkward mistakes (175), not troubled by other people talking behind back (176), tolerant of conceited, bragging people (177), would rather humor than show up a cheat (180), forgets it when people say bad things about him (181)

M Items 189, 192

can easily hide an unreasonable dislike for a person (189), always polite and diplomatic with unreasonable, narrowminded people (192)

O Items 225, 226, 228

not upset by being treated badly or disliked by acquaintances (225), not touchy or unhappy at inconsiderate acts or remarks by neighbors (226), spirits high, no matter how much trouble (228)

Q$_3$ Items 275, 277

can work carefully on most things without being bothered by people making a lot of noise (275), can still be serene if poorly thought of (277)

Q$_4$ Items 290, 291

can calm down again quickly when really upset (290), can keep it to self when annoyed by someone (291)

In his programmatic book, Cattell (1957) used rating descriptors for factors D and L which should be considered in relation to the interpretation of the foregoing items, since they are both prominently represented in this factor. These descriptors are as follows (pages 104 and 143):

Cattell factor D - Excitability

demanding, impatient vs. emotionally mature
attention-getting, exhibitionistic vs. self-sufficient
excitable, overactive vs. deliberate
prone to jealousy vs. not easily jealous
self-assertive, egotistical vs. self-effacing
nervous symptoms vs. absence of nervous symptoms
changeable, lacks persistence vs. self-controlled
untrustworthy vs. conscientious

Other associated variables: negativistic, unresponsive, reckless, noisy, over-aggressive bravado, "inferiority and compensation," homosexuality, impetuous, unconventional, ingenious, careless, enuretic

Cattell factor L - Protension (or Paranoid trend vs. Inner Relaxation)

suspicious vs. trustful
jealous vs. understanding
self-sufficient, withdrawn vs. composed, socially at home

Other associated variables: positive: aggressive, short tempered, shy, imperturbable, critical, precise, coldly objective, tense, extrapunitive, tyrannical, hostile, brooding, withdrawn, mulish, eccentric, skeptical (also, in some groups, unconventional, talented, and intelligent); negative: easy-going adventurous, genial, responsive, soft-hearted, not sadistic.

The distinction between these two factors appears more persuasive in relation to Cattell's interpretive hypotheses than on the basis of differences among the descriptors. He regards D as a dimension of "general excitability" that has neurophysiological as well as "indulgence-rejection" roots, while his term protension, applied to L, is a compounding of projection and tension. Without speculating about the implications of such dynamic hypotheses underlying behavior, it is entirely possible that different mechanisms implied by excitability and protension may produce convergent and overlapping responses to questionnaire items, as in the case of the present factor. The title assigned to this factor is RELAXED COMPOSURE vs. SUSPICIOUS EXCITABILITY, which combines the two emphases and also the distinction in relation to T 6, AGREEABLENESS vs. HOSTILITY, mentioned above.

Factor T 8 G 7 G-S 2. This factor was identified initially by the congruence of T 8, G 7, and supplementary Guilford factor 2. Its relation to Guilford source factor Co was further indicated by a correlation of .72 between G 7 and Co and of .42 between G-S 2 and Co.

The 32 salient items, with loadings in the range of .60 to .20, include 21 Co items as well as 11 additional items representing Guilford source factors Ag (2), CC (3), Cattell J (1), L (4), and Q_3 (1). Only three of the salient Co items, numbers 547, 553, and 555, were also listed as salient on T6. Those items dealt with suspicion of people who exaggerate their troubles (547) and victim of hard luck (553 and 555). The major focus of the salient Co items on the present factor is "people-oriented," emphasizing beliefs that people are irresponsible, inconsiderate, selfish, stupid, inferior, and incapable of functioning independently. This is illustrated in the following item tabulation.

Guilford Items (26, representing factors Co, Ag, and CC)

Co Items 524, 525, 526, 527, 529, 530, 534, 535, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 552, 553, 555

most people are shirkers (525, 527), people can't be trusted (539, 541, 542), people are insincere (543, 544, 545), people are thoughtless (526), people are selfish, exploitive, use "pull" (529, 535, 540, 546), people are stupid (524), emphasis on hard luck, blame, raw deal (547, 548,552, 553, 555), faultfinding with society, industrial injustice (530, 534)

Ag Items 511, 513

people are stupid, must be told what to do

CC Items 584, 586, 590

most people ignore standards of conduct (584), unless everybody recognizes duty to society, civilization is doomed (586), good manners are important (590)

Cattell Items (6, representing factors J, L, and Q_3)

J Item 157

people are unreasonable

L Items 182, 183, 184, 185

most people are "queer" mentally (182), distrust of overfriendly people (183), most people avoid dishonesty and criminality only for fear of being caught (184), anyone will lie to avoid trouble (185)

Q_3 Item 277

disregard of other people's evaluation

Almost without exception, the homogeneity of content with reference to faultfinding and deprecation of human nature among all the salient items on this factor is striking. Since the core of the factor is Guilford's Co, the title given to it is his, PERSONAL RELATIONS, as used in the Guilford-Zimmerman Temperament Survey manual (1949). In this manual, the trait P (personal relations, formerly Co, Cooperativeness) emphasizes tolerance of people and institutions (but mainly people) vs. hypercriticalness and faultfinding habits, as well as suspiciousness and self pity. The results on this factor provide excellent confirmation of Guilford's source factor, which is only minimally represented in Cattell's items.

Factor T 9 G 6 C 7 G-S 3. This is principally a Guilford factor, defined by his source factor G. It appears as factor 9 in the Total matrix and as factor 6 in the Guilford matrix. The congruence of these (Table 20) was -.95. Factor 7 in the Cattell matrix is moderately related to both of these, as is also supplementary Guilford factor 3 (see Tables 20 and 21). G 6 was identified with Guilford source factor G by a correlation of -.73 (see Table 25). The correlation of C 7 with source factor G was -.49. Factor G 6 was also correlated with Cattell source factor E, with a coefficient of -.3[illegible].

There are 40 items with salient loadings on this factor, in the range from .59 to .20. Of these 11 are Guilford G items (six of them among the nine highest) and 8 Guilford I items (three of these also among the nine highest). The remaining salient items are scattered among Guilford source factors M, N, S, D, C, and CC and Cattell source factors C, D, E, F, I, O, and Q_4.

This factor appears to be well defined by Guilford's descriptors for his factor G - General Activity, which emphasizes rapid pace, energy, vitality, health, efficiency, liveliness, and enthusiasm, as demonstrated in the following item tabulation.

Guilford Items (29, representing factors G, M, I, N, S, D, C, CC)

G Items 301, 302, 303, 304, 305, 306, 308, 309, 310, 313, 314

can do hard physical work and athletics longer than most people (301, 309), turn out much work in short time (302), walk, work, play faster than others (303, 304), "on the go" most of the time (305), rush from activity to activity without rest (306), bubble with excess energy (308), happiest on a project that calls for rapid action (310), quick in action (313), not slow and deliberate in action (314)

M Items 336, 350

sometimes regarded as a daredevil (336), prefer athletics to intellectual activities (350)

I Items 366, 367, 369, 370, 371, 374, 378, 385

health better than most people (366), better than contemporaries at making money (367), outstanding at one or more hobbies or skills (369), superior to most people in one or more abilities (371), always know what to do next (374), can cope with almost any situation (378), does things in which people are interested (385)

N Items 406, 407

not tired most of the time (406), does not wake up tired in morning (407)

S Items 411, 413

preference to take lead in group activities and social occasions

D Item 451

usually feel well and strong

C Item 466

feels upset to lose in a competitive game

CC Items 591, 594

work best when competition is keenest (591), tries to outdo everyone else in first day on job (594)

Cattell Items (11, representing factors C, D, E, F, I, O, Q_4)

C Items 23, 24

can find energy to face difficulties (23), lots of energy when needed (24)

D Item 47

can work hard with distraction

E Items 60, 61, 71

have characteristics definitely superior to most people (60), called a proud, "stuck-up" individual (61), shows nerve in meeting challenges (71)

F Item 86

considered a very enthusiastic individual

I Items 138, 152

feel more deeply than most people (138), can do hard physical work without feeling worn out as soon as most people (152)

O Item 231

does not avoid excessive excitement to prevent wear and tear

Q_4 Item 298

does not feel fatigued when getting up in the morning

The Guilford title, GENERAL ACTIVITY, reflecting the theme of his factor G, which is repeated among the salient items from the 14 other source factors contributing, is appropriate for this factor.

Factor T10 C10 C-S3. Factor 10 in the Total matrix was found earlier to be congruent with Cattell factor 10 and with supplementary Cattell factor 3. The respective coefficients of congruence were .89 and .74 and the coefficient between C10 and C-S3 was .78. This is clearly a Cattell factor. As shown in Table 27, C10 has a correlation of -.38 with Cattell source factor I, which is also correlated with C4 (.61) and C-S3 has a similar correlation of .37 with I; no other discriminable correlations with any of the source factors appeared.

There were 32 salient items, with loadings on T10 ranging from -.52 to .21. Of these, 25 are Cattell items, representing 10 source factors, and seven are Guilford items, representing four source factors. The prominent source factors are Cattell's I, as expected, with six items, A (which was related to I on T5), with five items, and M, with four items.

The numbers of salients for the remaining seven Cattell factors and the four Guilford factors are all one or two, except for Guilford's S, which has three. Although some similarity of this factor to T5 C4 C-S1 is suggested by the indicated source factors (Cattell's A and I) for salient items, the congruence coefficient between T5 and T10 is only .04 and the number of common salient items is small. On the other hand, the congruence coefficients of T10 with T4 and of C10 with T4 are between .5 and .6, suggesting a moderate relation of this factor with T4--Conscientiousness.

It is necessary to examine the salient items in some detail in order to develop some conception of this factor based on content. A tabulation of the salient items by source factor follows:

Guilford items (7 respresenting factors M, S, Co, CC)

M Items 352, 355, 360

fond of expensive clothes (352), prefer to study mathematics and science over literature and music (355), not disgusted at sound of foul language (360)

S Item 427

like to have many social engagements

Co Item 554

I am deserving of things far better than my present lot

CC Items 582, 587

not in favor of moral strengthening of country

Cattell items (25 representing factors A, C, E, F, G, I, J, M, N, Q_1)

A Items 5, 6, 10, 14, 17

preference: to be a business office manager over an architect (5), insurance salesman over a farmer (6); preference: to spend vacation at a well-attended holiday town over a quiet cottage off the beaten track (10), to have a house in a sociable suburb rather than alone in a deep wood (14), preference for the life of a secretary running a social club over that of an artist

C Item 27

would have it the same if life could be lived over

E Item 75

not disgusted at foul language

F Items 84, 85

preference for a lively party over a quiet hobby (84), enjoys large gatherings, like parties or dances (85)

G Items 107, 111

would not contribute surplus income to church or other worthy cause (107), not in favor of stricter observance of moral laws (111)

I Items 141, 142, 145, 146, 149, 153

preference to read political over religious book (141), preference for headline on business improvements over religious event (142), school preference for mathematics or arithmetic over English (145), preference to be a colonel over a bishop (146), preference to be a manager in a technical manufacturing concern over a guidance worker with young people (149), preference for money over time to think about life (153)

J Item 157

preference to run a class picnic over knowing all the trees

M Items 196, 198, 201, 202

interest in practical success exceeds that in artistic and spiritual truths (196), would rather be leader of a group in a camp than bird-watch and walk in the country with a friend (198), preference to be a

3

public accountant or insurance man over life of an artist or naturalist (201), advocates greater freedom in divorce over prescription of stricter Sabbath observance (202)

N Item 209

it is more important in the modern world to solve political problems than questions of moral purpose

Q_1 Items 245, 247

birth control is essential to solve world problems (245), society should let reason lead it to new customs and throw aside old habits or mere traditions (247)

The emphasis in these items is on behavior and ideas that are practical, unsentimental, antitraditional, including antireligious, technically modern and efficient, not necessarily "couth" or gentile, and not in accord with conventional moral values. There is also a gregarious component, represented by the Cattell A items most typically, which appears in T10, but not in C10 or C-S1, which involves activities of a social nature and with people rather than those requiring solo work or being alone. Perhaps the rejection of traditional religion involves the substitution of man as a meaningful source of support.

In any case, despite the salience of Cattell A, I, and M items and the inclusion among the salients of only two Q_1 items, the salient markers for this factor fit Cattell's description of his factor Q_1-Conservatism vs. Radicalism, quite well. The titles of the Cattell item clusters, as noted above, were: (1) seeking new methods, (2) antagonism to old ways, (3) intellectualism, (4) advocacy of new moral standards, and (5) elevation of reason and logic. However, the 16 Q_1 items used as markers for their source factor in this study range in loadings on T10 from a maximum of .14 to a minimum of .02, with a mean of .10, while maximum loadings, ranging from .42 to .11, are distributed among 11 factors with no more than two on any factor. In view of the content analysis of the salient items on T10, the title, RADICALISM vs. CONSERVATISM is retained, with the "radical" pole mentioned first in accordance with the empirical results on this factor.

The relation of patterns of item loadings on C10 and C-S3 to those on T10 is shown below. It should be noted that the numbers of salient items and the loading ranges, essential to the comparison, are as follows:

	number of salient items	loading range	
		max.	min.
Factor T10	32	.52	.21
C10	18	.50	.21
C-S3	13	.37	.15

The salient items for each of these factors are indicated by source factor, as follows:

		Factor T10	C10	C-S3
Guilford items:	M	352, 355, 360	355, 360	355, 360
	S	427		
	Co	554		
	CC	582, 587	582	582
Cattell items:	A	5, 6, 10, 14, 17	6, 19	
	C	27		
	E	75	75, 111	75
	F	84, 85		
	G	107, 111	107	107
	I	141, 142, 145	141, 142, 145	141, 142,
		146, 149, 153	146, 149, 153	146, 153
	J	157		
	M	196, 198, 201, 202	196, 201, 202	196, 202
	N	209	209	209
	Qi	245, 247		245

Only two of the 18 salients on C10 are not among the salients on T10 (A19 and E111) and of the 13 salients on C-S3, all are represented on T10 and all but one ($Q_1$245) are on C10.

Factor T11 C9. Although factor 11 in the Total matrix was moderately congruent with Cattell factor 9, no significant correlations with source factors were observed. This is a small factor, with a variance in the 18-factor Promax matrix of 3.36, and has only 13 salient items, in the range of .54 to .20, of which five are Cattell items (C31, D47, E62, $Q_3$275, $Q_4$297) and eight are Guilford items (I381, 387, N400, O503, 504, and Co548, 550, 551).

As shown below, the salient items on this factor (T11) cluster around three themes: ideas of reference or feelings of rejection, low resistance to distraction, and resentment.

Guilford items (8, representing factors I, N, O, Co)

I	Item 387 feeling of rejection by others
N	Item 400 long-continued noises "get on my nerves"
O	Items 503, 504 some people are intentionally trying to avoid me (503), other people deliberately say things to annoy me (504)
Co	Items 548, 550, 551 have been given "raw deal" through spite (548), people frequently talk behind my back (550), people deliberately make things hard for me (551)

Cattell items (5, representing factors C, D, E, Q_3, Q_4)

C Item 31

some people annoy or avoid me, I don't know why

D Item 47

I cannot work without being bothered if it is noisy

E Item 62

I never make sarcastic remarks to people, if I think they deserve it

Q_3 Item 275

I cannot work carefully without being bothered by noise

Q_4 Item 297

I do not doubt that people are interested in what I am saying

The coefficients of congruence of factor T11 with the other Promax factors in the 18-factor rotation are all negligible, the highest being .32 with T13. This factor is not clearly related to any of the source factors in the Guilford or Cattell systems, although it draws items reflecting paranoid ideation, resentment of rejection, and distractibility from nine of them. Provisionally a title of PARANOID SENSITIVITY is assigned, which related the distractibility items to the core of ideas of reference and rejection.

Factor C9 differs from T11 mainly in that the items with highest loadings reflect distractibility and ease of disturbance by minor annoyances, many of which are involved in T11, but only two of the paranoid items (C31, some people seem to ignore or avoid me although I don't know why, and Guilford O503, I know of some people who are deliberately trying to avoid me) among the 20 salients ranging from loadings of .63 to 20.

Five Guilford items are among the salients on this factor: A316, dislike of being watched while working; N399, distractibility by disturbing stimuli; N400, noises get on my nerves; N403, annoyed by people who hurry me; and O503, people are trying to avoid me. The Cattell salients are: A17, prefer life of an artist over being social club secretary; C31, some people seem to annoy me; D47, inability to concentrate without being bothered by noise; D48, tell people to keep quiet if they get too noisy while I am working; D49, unable to listen to radio if people are laughing and talking; D50, music is spoiled if people chatter; D56, get tense before an examination; H127, dislike being watched at work; I152, cannot do hard work withoug being worn out, as soon as most people; M201, prefer to be artist or naturalist over public accountant or insurance man; N216, not embarrassed to be waited on by servants; Q3275, cannot work carefully without being bothered by noise; $Q_4$288, nerves get on edge and have "shivers" from screechy sounds, $Q_4$295, tend to perspire when contemplating difficult job ahead.

These markers appear to be most clearly related to several aspects of Cattell's factor D-Excitability, which is the most prominent source factor among the salient items on Cg. Excitability is certainly an aspect of paranoid sensitivity, the title of T11, but in T11 it is mingled with paranoid ideation. This analysis explains the moderate congruence between T11 and Cg and indicates where the two are similar as well as where they differ.

Factor T12 G10. Factor 12 in the Total matrix had a congruence coefficient of .88 with Guilford factor 10 (Table 20), which in turn was identified with Guilford source factor T by a cluster correlation coefficient of .44 (Table 26).

For factor T12 there were 35 salient items in the range of .55 to .20, representing 10 Guilford source factors and 9 Cattell source factors. The two prominent source factors among the salients were Guilford T, with five (which include the top three) and Cattell Q_1, with four. In view of the large number of source factors represented in this factor, a review of item content is necessary before any comments on it can be made.

Guilford items (18, representing source factors G, A, M, I, N, T, R, O, Ag, Co)

G Item 314

inclined to be slow and deliberate in movement

A Item 317

usually speak out in a meeting to oppose someone I feel sure is wrong

M Item 350

more interested in intellectual things than athletics

I Item 370

I have one or more abilities on which I am superior to most people

N Items 405, 406

require more sleep than other people (405), tired most of the time (406)

T Items 433, 435, 436, 437, 438

philosophically inclined (433), often philosophize about the purpose of human existence (435), inclined to analyze motives of others (436, 437, 438)

R Items 482, 483

inclined to be overconscientious (482), not inclined to take my work casually (483)

O Item 496

continually comparing self with others

A9 Items 509, 511, 514

despises "yes men" (509), most people are stupid (511), resents being given orders by friends or family (514)

Co Item 528

would change many things about human nature, if permitted

Cattell items (17, representing source factors C, E, F, H, I, J, N, Q1, Q_2)

C Items 34, 39

critical of other people's work (34), does not admire parents in all important matters (39)

E Item 60

I have some characteristics on which I feel definitely superior to others

F Item 91

does not have fewer friends than most people

H Item 133

can cut into conversations as easily as most people (can express ideas)

I Items 136, 138

more sensitive than most people to artistic quality of surroundings (136), feel more deeply than most people do (138)

J Item 165

often take a lone stand in group discussions

N Items 205, 206

always keenly aware of propaganda attempts (205), never fail to notice propaganda in things I read (206)

Q_1 Items 237, 239, 244, 252

considered a liberal "dreamer" of new ways rather than a practical follower of well-tried ways (237), likes to think of ways to improve the world (239), prefers to play chess over bowling (244), prefers scientific essay on harnessing world resources over historical novel (252)

Q_2 Items 253, 255, 264

when constructing something, would rather work alone (in preference to with a committee (253), does not hesitate to use own ideas (255), many people ask my advice (264)

The predominant themes of the foregoing marker items are (a) thoughtful and reflective, associated with altruistic and conscientious values, (b) self-sufficient and superior, and (c) critical. The total impression is that of an intellectual snob. This description involves an interesting blend of the thoughtful flavor of T with the independence of Q_2 and the analytical free-thinking of Q_1. Whether this can be accepted as a well-defined factor or as one requiring more careful rotation is a matter requiring further analytic effort. Tentatively, however, factor T12 is given the title, CRITICAL THINKING, which combines the ideas expressed in the content analysis of the salient items.

The salient items on G10 include 31 items ranging in factor loadings from .57 to .20, with 19 of the 34 salients on T12 included. Of these, 13 are Guilford items and 6, Cattell items. The five salient T items on T12 reappear on G10, with one additional T item (429). Factor G10 resembles T12 in salient item content in respect to the three themes noted above and the title, CRITICAL THINKING, appears equally appropriate, despite the variation of specific defining items.

Factor T13 G12. The alignment of G12 with T13 is based on a coefficient of congruence of .77 and considered a moderate match, at best. However, they can be considered together in order to compare item content. Factor G12 is correlated only with Guilford source factor Ag in Table 26; this is low and can hardly be regarded as a strong hypothesis. Further definition of both T13 and G12 therefore depends on item content. Factor T13 is most prominently defined by items from Guilford factors A and Ag and Cattell factor H, in addition to items from Guilford factors I, S, R, O, and Co, and Cattell factors A, C, D, E, J, L, M, O, and Q_2. Factor G12 resembles T13 in the frequency of A and Ag markers; it differs in the absence of H (having only one H salient) and in the increased prominence of Co (two compared to five salients). The following tabulation shows item overlap among the two factors, in relation to common and discrete markers by source factor.

Source Factor		Common to both factors	T13 only	G12 only
Guilford	A	318, 320, 322, 323, 324	317, 319, 321	
	M			336, 356, 361
	I	387	379, 386	
	S		414, 421	
	R		489	
	O	503		504, 505
	Ag	518, 519, 521	510, 521, 523	508, 509
	Co	548, 549		533, 550, 551
	CC			580
Cattell	A		11, 20	
	C	31		
	D		48	
	E	62, 65, 78		
	H	125	117, 120, 124 129, 131	
	J		168	
	L	179		177
	M	189		
	O		229	
	Q_2		255	
	Q_4			288
Number of items		19	22	13

The orientation of factor loadings, by sign, is in the direction of agreeableness rather than hostility. The Guilford A items include one complete cluster (A2) which Guilford entitled "maintaining one's rights" (318-324); item 317 involves speaking up at a meeting to oppose someone who is wrong. The Ag items are drawn from three clusters (508, 509, 510 from Ag1-contempt of others; 518, 519 from Ag3-hostility; and 521, 523 from

Ag4-overt aggression). The one H item common to both factors is 125 (I speak my mind no matter how many people are around), while the five that appear in T13 only reflect absence of shyness, inferiority, and insecurity in social relations, including the opposite sex.

The remaining items that are discrete to T13 express ideas of self-confidence in abilities (I379) and acceptance by others (I386), social poise (S414), absence of shyness (S421), lack of reticence (R489), enjoyment of social contact in selling or soliciting funds (A11), ability to express feelings (A20), tolerance of noisy people (D48), unwillingness to impose on friends (J168), control of excessive emotionality (O229), and confidence in own ideas ($Q_2$255).

Only five of the 39 salient items on factor T6 (agreeableness vs. hostility), described earlier, are among the salients on T13 or G12; these are Co549 (salient on both), Ag510 (T13), and Co550 and 551 (G12). The major difference between T6 and T13 is that T6 involves self-oriented satisfaction or dissatisfaction with things and people and is consequently passive, whereas T13 is active, aggressive, uninhibited, and outgoing. To distinguish it from T6, the title assigned to T13 is CONSIDERATENESS vs. AGGRESSIVE DISREGARD OF OTHERS. Both involve pleasant or unpleasant effect toward people and the environment, but they differ in behavioral characteristics.

The remaining items, other than A and Ag, that are discrete to G12, involve not disgusted by unshaven men or by pimples (M356, 361), not regarded as a daredevil (M331), other people do not deliberately annoy me (O504), sometimes feel sorry for a person convicted of a crime (O505), do not lack patience with a "shrinking violet" type of man (Ag508), do not despise a "yes man" (Ag509), refuses to criticize the educational system (Co533), people do not talk about me behind my back (Co550) or make things hard for me (Co551), not opposed to old fashioned customs (CC580), can put up with conceited, bragging people (L177), nerves not on edge from screechy sounds ($Q_4$288).

Despite the difference in source factors represented by the markers for G12, as compared with T13, no difference in interpretation of the factors in terms of item content is indicated. Provisionally, therefore, the title assigned to T13 is retained for G12, as well.

Factor T14 C11. Factor C11 was moderately aligned with T14 with a coefficient of congruence of .68 (Table 20) and no hypothesis as to content was given in the cluster correlation analysis. This is one of the smallest factors in the set of 18 Promax factors, with a variance of 2.68 and it has only 16 salient items with loadings in the range from .67 to .20. Indeed, only the first two salients have high loadings ($Q_4$296, .67 and D56, .64); the next highest loading on item O492, is .28.

The 18 salient items are drawn from seven Guilford source factors and from six Cattell source factors, the most prominent of which are Cattell's Q_4, with three items and Guilford's O, with two. The two highest loadings represent items concerned with anticipatory anxiety related to tests or examinations and the remainder reflect various symptoms related to DISPOSITIONAL ANXIETY. This is illustrated in the following summary of the 18 salient items.

Guilford items (8, representing source factors A, I, N, T, C, R, O)

A	Item 316 dislike being watched while working
I	Item 370 do not have one or more abilities superior to most people
N	Item 392 finds it difficult to sleep at night
T	Item 429 does not meditate frequently
C	Item 461 finds it difficult to sleep because of persistent ideas
R	Item 483 does not take work casually
O	Items 492, 495 self-concern and ego-centrism

Cattell items (8, representing source factors D, E, H, O, Q_3, Q_4)

D	Item 56 tense before examinations
E	Item 60 do not feel superior to others

H Item 127

dislike of being watched while working

O Item 222

overconscientious, worries about past mistakes

Q3 Item 276

tends to get overexcited and rattled

Q_4 Items 288, 295, 296

nerves get on edge with screechy sounds (288), tremble or perspire before difficult tasks (295), tense before examinations (296)

Factor C11 has 15 salient items loading between .57 and 20. Of these 10 are Cattell items and 5, Guilford items. Six of the Cattell salients and two of the Guilford salients also appear as salients on T14. In addition the defining items with the highest loadings on C11 have comparable loadings on T14, as shown below:

Item Number	Factor C11	Factor T14
$Q_4$296	.57	.67
D56	.57	.64
$Q_3$276	.28	.22
O222	.27	.21
R483	.26	.27

The seven salient items on C11 that are not among the salients on T14 are nevertheless compatible with the interpretation of DISPOSITIONAL ANXIETY, as shown in the following tabulation:

Guilford items: I387

many people do not want to associate with me

S414

troubled by being self-conscious

C457

rattled at critical moments

Cattell items: H117

my reserve always stands in the way in relations with the opposite sex

J157

there are times when I think people are so unreasonable they can't be trusted to look after their own good

L182

most people are not queer mentally

$Q_2$262

is bothered to be unconventional or odd

The predominance of Cattell items on C11 which match the markers on T14 supports the indications from the congruence analysis that this is primarily a Cattell factor. On the other hand, the number of markers from Guilford and Cattell source factors on T14 is equal.

Factor T15 G9. Factor G9 was identified in Table 20 as moderately congruent with T15 (coefficient of congruence of .81) and in Table 26 as correlated with Guilford source factor R (r =.44).

Examination of the salient items for both factors indicates much similarity of defining items, with Guilford source factors R, C, and D, and Cattell factor F contributing the most markers.

For factor T15 there are 50 items in the range of loadings from .79 to 20, representing 10 Guilford source factors (25 items) and 10 Cattell factors (25 items). The items with highest loadings come from Cattell's F and Guilford's R and focus on happy-go-lucky, carefree, daring, light-hearted vs. serious. A complete listing of the T15 salients is as follows:

Guilford items (25, representing source factors G, A, M, I, N, S, T, D, C, R)

G Item 308

often bubbling with excess energy

A Items 316, 330

do not dislike being watched while working (316), like to take initiative to enliven a dull party (330)

M Item 336

sometimes regarded as a daredevil

I Items 381, 382

not dissatisfied with appearance or attractiveness

N Item 390

self-rating not as a tense individual

S Items 412, 428

"life of party," enjoy entertaining people

T Item 430

do not like to have time to be alone with thoughts

D Items 440, 444, 445, 446, 447

not frequently in low spirits (440), not inclined to worry over misfortunes (444), have not lost sleep over worries (445), can usually keep cheerful in spite of troubles (446), usually in good spirits (447)

C Items 456, 458, 470

usually in fairly uniform spirits (456), considers self less emotional than the average person (458), mind wanders while trying to concentrate (470)

R Items 475, 476, 477, 478, 479, 485, 486

ordinarily a carefree person (475), subscribes to "eat, drink, and be merry" philosophy (476), prefers slapstick comedy to serious drama (477), views self as happy-go-lucky (478), inclined to act on spur-of-the-moment (479), often craves excitment (485), likes to play pranks on others (486)

Cattell items (25, representing source factors C, F, G, H, J. L, N, O, Q_3, Q_4)

C Items 37, 38

sleep not usually disturbed by vivid dreams (37), always a sound sleeper (38)

F Items 79, 80, 81, 82, 84, 85, 89, 90

enjoy doing daring, foolhardy things, just for fun (79), prefers job with change, variety, and travel, even if it involves dangers (80), likes excitment and bustle (81), likes acting on impulses even if they cause difficulties later (82), prefers lively party to dull hobby (84), greatly enjoy large gatherings, parties, dances (85), well described as happy-go-lucky, nonchalant person (89), take it on self to liven up a dull party (90)

G Items 104, 116

handles difficulties as they come (104), most people take life too seriously (116)

H Items 127, 130

somewhat dislike having a group watch me at work (127), more interested in enjoying than winning, even an important game (130)

J Items 155, 164, 171

does not enjoy being object of a joke by classmates (155), gets in trouble more often by saying "let's go" than by withdrawing (164), would speak up in a friend's defense if a supervisor criticized him more than seemed right (171)

L Item 175

can forget an awkward social mistake

N Item 206

generally insensitive to propaganda

O Items 228, 233

spirits generally high no matter how great the trouble (228), do not wake up in the night and worry

Q_3 Item 269

like to say things as they occur to me

Q_4 Items 286, 292, 293

rarely in mood not to see anyone (286), can forget worries and responsibilities easily (292), do not experience tension and turmoil in reviewing day's happenings

The foregoing items, with some exceptions, discussed below, appear to be related to the source factor descriptions of Guilford's R and Cattell's F, about equally well. Factor R, called Restraint in the Guilford-Zimmerman manual (1949) and formerly Rhathymia (designating the opposite pole) is described as *serious-mindedness*, *deliberate*, *persistent effort*, and self-control, at one pole, versus happy-go-lucky, carefree, impulsive, and excitement-loving, at the other. Cattell's factor F, Desurgency vs. Surgency, is presented in the 1954 manual of the 16-PF Test (Cattell, et al., 1954) with the descriptors sober, prudent, serious, taciturn, at the Desurgent pole, versus happy-go-lucky, heedless, gay, enthusiastic, at the Surgent pole.

In view of the similarity of descriptive definitions and the presence of both R and F items among the top salients on factor T15, it is necessary to raise the question of why the congruence analysis identified T15 as a Guilford factor, moderately aligned with G9, and revealed no relation of consequence with Cattell variance. Further, it will be recalled that Cattell factor F was strongly involved in factor T2 G2 C2, along with Guilford's S and A and Cattell's H. In order to answer this question it is necessary to compare factors T2 and T15, particularly in relation to factor loadings of common salient items.

Of the 50 items listed as salient on T15, 10 are listed among the 74 salients for T2. These items are shown in Table 31, with their factor loadings on T2 and T15. In addition the R and F items loading only on T2 or T15 are also listed with their respective factor loadings. Comparison of these items and their loadings not only clarifies the difference between T2 and T15, but also reveals an interesting split in the content of Cattell's factor F, and to some extent a similar one in Guilford's R.

As shown in Table 31, the items that load primarily on factor T2 reflect social initiative, social interaction, enjoyment of social activities primarily and happy-go-lucky, gay moods secondarily, while those that align principally on T15 reflect nonchalant, happy-go-lucky, enthusiastic, impulsive tendencies. Among the items having loadings of .20 or higher on both factors, they tend to align with one or the other factor on the basis indicated, while those that have salients on T2 only all reflect Social Extraversion and those that load only on T15 reflect the happy-go-lucky, nonchalant, impulsive tendencies.

Of the five Cattell F items listed as salients on both factors, only one (89) is a marker for T15; the other four (81, 84, 85, 90) are clearly markers for T2, as are the four that have loadings from .38 to .52 on T2 but not discriminably greater than zero on T15 (83, 87, 91, 97). On the other hand, the three markers for T15 (79, 80, 82) are clearly Social Extraversion items. This analysis suggests that Cattell's source factor items for F are split between factors T2 and T15. It seems that the items rather than the factor description require relabeling. If the F items that should be assigned to T2 were removed, the match between F and Guilford's R would be better.

On the other hand, R is also similarly, although not as conspicuously impure. Item R477, listed in Table 31 as common to both factors, fails to achieve a high loading on either, while R487 is clearly a social extraversion

Table 31. Comparison of factors T2 and T15 with respect to common salient items and factor loadings of Guilford R and Cattell F markers.

Item Group	Source Factor	Item	Factor loading on:	
			T2	T15
Common to T2 and T15	G-S	412 enjoys being life of party	.62	.26
		428 enjoys entertaining people	.58	.21
	G-A	330 takes initiative to enliven a party	.65	.20
	G-R	477 prefers slapstick comedy to serious drama	.28	.23
		478 inclined to act on spur-of-moment	.32	.76
	C-F	81 likes excitement and bustle	.43	.40
		84 prefers lively party to dull hobby	.49	.29
		85 enjoys gatherings, parties, dances	.62	.23
		89 happy-go-lucky, nonchalant person	.36	.78
		90 takes it on self to liven up a dull party	.67	.31
T2 only	G-R	487 shows "rah rah" enthusiasm	.33	.14
	C-F	83 attends and enjoys social functions	.52	.03
		87 tells stories, jokes	.38	.12
		91 does not have fewer friends than most	.38	.12
		97 not awkward in company	.38	.14
T15 only	G-R	475 ordinarily a carefree person	.20	.64
		476 subscribes to "eat, drink, be merry"	.14	.32
		479 inclined to act on spur-of-moment	.02	.25
		485 often craves excitement	.24	.29
		486 likes to play pranks on others	.14	.31
	C-F	79 enjoys daring, foolhardy things	.16	.51
		80 likes job with change, variety, travel, even if danger is involved	.12	.25
		82 likes acting on spur-of-moment even if it lands in difficulties	.03	.30

item and should not be included in the same factor category as 475, 476, 479, 485, and 486.

In view of the analysis of the salient items on T15 and the comparison of T15 with T2, the tentative title assigned to T15 is a combination of R and F descriptors: SERIOUS, PRUDENT vs. HAPPY-GO-LUCKY, IMPULSIVE.

Factor G 9 is represented by only five Guilford source factors, of which R, C, and D are the most prominent, and by 10 Cattell source factors, dominated by F. There are 38 salient items, in the loading range of .60 to .20, of which nine are above .30. These include F89, F79, R478, R475, and R476, which as shown in Table 31, are salient markers for factor T15. Of the 38 markers for G9, 24 are also markers for T15 (Guilford: M336, D440, 445, 446, 447, C456, 458, 470, R475, 476, 478, 479, 486; Cattell: F79, 81, 82, 89, G116, L175, N206, O228, $Q_3$269, and $Q_4$286, 292).

Although the theme of G9 corresponds to T15 and, in the frame of reference of the Guilford factor structure, to his factor R, the contributions of factors C and D (Guilford) must be understood on the basis of item relevance rather than source factor relevance. The provisional title of factor G9 is the same as that for T15.

Factor T16. This factor was not related to any other factor in any of the analyses. It is small, with a variance of 4.16, and has only 15 items in the range of loadings from .39 to .20. The source factors of highest marker frequency are Guilford's T, with 4 salients, and C, with 3; however the items representing these factors have loadings below .30, while the five items with loadings over .30 are M364 (.39), O505 (.36), J161 (.34), O506 (.33), and M362 (.30). The content of the 15 items is shown below.

Guilford items (12, representing source factors M, T, C, R, O)

M Items 362, 364

sympathy for a mistreated horse (362), for an injured bird (364)

T Items 430, 431, 435, 436

like to be alone with my thoughts (430), frequently take time out to meditate (431), often philosophize about purpose of human existence (435), inclined to analyze motives of others (436)

C Items 462, 463, 473

often run over in mind events of day before going to sleep (462), spend much time thinking over past good times (463), sometimes daydream (473)

R Item 479

not inclined to act on spur-of-moment

O Items 505, 506

sympathy for convicted criminal (505), sympathy for other people's troubles

Cattell items (3, representing source factors J and Q_1)

J Items 161, 162

have sometimes thought what I would do if I were the only person left in the world (161), have thought a lot about what I would do if lost on a journey (162)

Q_1 Item 239

like to think of ways of improving the world

These items represent thoughtfulness, meditation, and altruistic, sympathetic attitudes. Since several of them have appeared on lists of salients for previous factors, the entire list of 15 was checked in the Promax factor matrix to determine which have unique loadings or have highest loadings on T16. These include five items, M362, 364, T430, and J161, 162, which reflect both the sympathy and mediation themes. A tentative title for this factor is EMPATHIC MEDITATION.

Factor T17 G-S6. Factor T17 is moderately congruent with Guilford supplementary factor 6 (congruence coefficient, .60) and both appear to be defined by items from Guilford's source factor M, although the factor loadings are apparently too low to reflect this in the cluster correlation coefficients. Of the 24 items with highest loadings in the range from .58 to .20, 11 are from Guilford's M and three from Cattell's O; seven M and one O item define the eight highest loadings, over .31. The content of the 24 salients is as follows:

Guilford items (13, representing source factors M, I, Ag)

M Items 335, 337, 338, 339, 340, 341, 342, 344, 346, 348, 353

do not cry or weep (341, 342, 344), no proneness to fears (335, 337, 338, 339, 340), preference of masculine job or activity (346, 348, 353)

I Item 370

feeling of superiority in abilities

Ag Item 521

enjoy a good fight

Cattell items (11, representing source factors C, D, E, F, M, N, O, Q4)

C Items 22, 35

no proneness to fears (animals, wide streets, being alone)

D Item 56

no tension before examinations

E Item 60

feeling of superiority

F Item 80

preference for job with change, travel, variety, even if dangerous

M Item 197

reading preference for war books over fairy tales

N Item 216

embarrassed to be waited on by servants

O Items 230, 232, 234

do not weep or cry (230, 232), no proneness to fears (234)

Q4 Item 296

keep calm before an examination

Eight of the Guilford M items, two Cattell C and two Cattell O items have their highest loadings on T17. Of these, five form a cluster related to rejection of weeping or crying (M341, 342, 344, O230, 232), and seven, a related cluster involving rejection of fearsomeness (M335, 337, 338, 339, 340, C22, 35). The remaining salient items relate to absence of tenseness before examinations (D56, $Q_4$296) and masculinity in reading preference (M197), vocational choice (M346, 348, F80), activities (M353, Ag 521), and attitudes toward servants (N261), as well as feelings of superiority (I370, E60). This factor is obviously related to Masculinity. However, factor T18 is also defined by Guilford M items and the M clusters on T17 are restricted to rejection of feminine emotional displays of crying and showing fear, while other Guilford M items have their principal loadings on factors T2, 4, 5, 6, 10, 12, and 15. This analysis has not upheld the integrity of the M source factor as a discrete personality dimension and to be consistent with that finding, the term masculinity is not included in the provisional factor title. Instead a title is proposed which reflects the concepts expressed in the defining clusters, STOICISM, FEAR DENIAL vs. WEEPING, FEAR PRONENESS.

Factor G-S6, supplementary factor 6 of the residual Guilford matrix elaborates the pattern of T17, but does not include the masculine items appearing on T18, which follows. An abbreviated analysis of the content of the items salient on G-S6 is as follows:

finds it easy to demand a refund (A323)
not fearful (M335, 337, 338, 339, 340, C22, 35)
does not cry easily (M341)
masculine vocational choice (M346, 347, 348, 349)
not sympathetic for injured animals (M362, 363, 364)
antagonism, hostility, hard luck (Co551, 552, 553, 555)

It seems that the rugged aspect of not being disgusted by uncouth appearances and behavior, which is expressed on both T18 and T4 has emerged in the present study more as a matter of social conformity than rugged masculinity. This may be particularly true of the military recruit sample tested in the present study, to whom such "masculine" behavior would be unmilitary. Of course, the same items, in the combat situation, would be appropriately masculine. As an absolute, one may regard ruggedness as masculine, but empirically, it seems to be better interpreted as conforming to social norms. For this reason, factor G-S6 is regarded at this time as aligned with T17 and is similarly interpreted.

Factor T18. This final factor among the 18-factor Promax results has a variance of 2.72 and no observable congruence with other factors. It is defined principally by the Guilford M cluster related to disgust at uncouth behavior and appearances (M356, 357, 358, 359, 360, 361) and two related Cattell items (C33 and E75). These M items and C33 have comparable factor loadings on factors 4 and 18, as shown in Table 32, which compares the loadings on these two factors for the 15 salient items (loading range, .42 to .20) on T18. The two items expressing disgust with foul language (M360 and E75), which have major factor loadings on T4 are also among the highest on T18.

In attempting to interpret the item content, as shown in Table 32, the following facts need to be taken into account: (1) Factor T18 is obliquely

Table 32. Comparison of factor loadings on T4 and T18 of fifteen items salient of T18.

Item		Factor Loading	
		T4	T18
G-M341	cry easily	-.14	.21
M356	disgusted by pimples	.20	-.36
M357	disgusted by dirty fingernails	.35	-.31
M358	disgusted by perspiration odors	.36	-.40
M359	disgusted by sight of pus	.25	-.32
M360	disgusted by foul language	.78	-.42
M361	disgusted by unshaven man	.48	-.30
N407	wake up tired in morning	-.04	.23
C-A 11	finds selling and soliciting unpleasant	.10	-.22
C 33	disgusted by sloppy people	.29	-.26
E 75	disgusted by foul language	.71	-.32
I 140	good taste in telling jokes	-.22	.21
J 168	reluctance to impose on friends	.02	.20
O232	cry easily	.08	-.22
Q3275	not easily disturbed by noise	-.04	-.22

related to T4 and might be subsumed under T4 by further rotation. (2) Factor T18 represents another facet of masculinity. The tentative tile assigned to T18, TOLERANCE OF ROUGH, UNCOUTH BEHAVIOR vs. GENTEEL, PROPER, REFINED, reflects both of these facts. The trait defined by this title is a component of CONSCIENTIOUSNESS (T4), as far as conformity to socially approved standards is concerned, but the defining cluster of T18 may be important enough to warrant treatment as a separate entity. This latter observation is bolstered by the factor loadings, in Table 32, of such items as M341, N407, A11, J168, O232, and $Q_3$275, which reflect the masculinity distinction of T18, but have negligible loadings on T4.

Summary of Provisional Factor Titles. Provisional titles were assigned to the 18 Promax factors after examining congruences among all rotated factors, correlations of empirical factors with source factors (by cluster correlation computations), and item content of salient items with factor loadings of .20 or higher. More exact decisions concerning the 18 factors are reported next, based on consideration of factor markers, that is, items with principal loadings on a factor, of .20 or higher. Summaries of the distributions of salient and marker items, by empirical factor and by source factor, are presented in Tables 33 and 34. Table 35, using data from several tables, summarized the results to this point, showing provisional factor

Table 33. Summary of numbers of salient items on 18 Promax factors, by source factor. Salient items are defined as having factor loadings of .20 or higher, regardless of loadings on other factors.

Source		No. source	No. salients by Promax Factor																		Zero Salient	
Factor		Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Items	
G	G	14	2	1		1		1			11			1			1				0	
	A	20	5	7					2					1	9	1	2				3	
	M	30	3	2	3	8	6	1	3		1	4		1			1	2	11	7	2	
	I	24	10	1		1		4	1	8	8		2	1	3	1	2		1		3	
	N	19	18						2		3		1	2		1	1			2	1	
	S	21	4	19				1			2	1	1		2		3				0	
	T	11	5		1									5		2	1	6			1	
	D	14	12					3	1		1						5				1	
	C	21	18					1	3		1					1	3	3			1	
	R	17	4	5	1	2		1	2					2	1	1	7	1			0	
	O	16	11					1	2				2	1	1	2		2			0	
	Ag	16	2					2	4	2			1	3	6				1		4	
	Co	32	1			1		7	1	21		1	3	1	1		1				1	
	AA	20			20		1	1													0	
	CC	25				17		5		4	2	2									5	
C	A	20		5	1		12	1	1			5			2			1		1	2	
	C	20	8			3		1	2			1	1	2	1		2		1	1	3	
	D	19	7					2	10		1		1		1	1			1		2	
	E	19	1			5			1		3	1	1	1	3	1	1		1	1	5	
	F	19	3	12	1	4	2		1		1	2		1			8		1		0	
	G	19	1			12		4				2					2				2	
	H	19	4	15		2			1					1	6	1	2				1	
	I	19	1		1	6	6	1			1	6					1		1	1	2	
	J	18		3				1	3	1		1		1	1		3	2		1	4	
	L	16	1			1			6	4					2		1	1			4	
	M	16	4		1	2	1		2			4		1	1				1		4	
	N	16	3		1	5	2	2	1			1		2			1		1		2	
	O	16	12	1				2	3		1				1	1	2		3	1	2	
	Q1	16	1		1	1	1	1				3		4				1			6	
	Q_2	16	4	3	1			3			1			3	1						6	
	Q_3	16	5		1	3			4	1			1			1	2			1	4	
	Q_4	16	12			1			3		1		1			3	3		1		0	
Guilford		300	95	35	25	30	7	28	21	27	29	8	10	18	23	9	27	14	13	9	Total	428
Cattell		300	67	39	8	45	24	18	38	6	9	26	5	16	19	8	28	5	11	7		379
Total		600	162	74	33	75	31	46	59	33	38	34	15	34	42	17	55	19	24	16		807

Table 34. Summary of numbers of marker items with principal factor loadings on the 18 Promax factors, by source factor. Only items with factor loadings of .20 or higher are included.

Source Factor		No. source Items	No. markers by Promax Factor																		No. Items with Zero Markers
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
G	G	14	1	1		1		1			10										0
	A	20	1	3											8						8
	M	30		1	1	3	2	1				1		1			1	2	7	3	7
	I	24	5			1		1	1		6		1								9
	N	19	16																		3
	S	21	2	16																	3
	T	11	2											3				1			5
	D	14	10						1												3
	C	21	16						2												3
	R	17	4	2													4				7
	O	16	6						1				1					2			6
	Ag	16						1	2	1			1	1	2						8
	Co	32						2		17		1	1	1	1						9
	AA	20			20																0
	CC	25				12		1		1	2										9
C	A	20		1			10					1									8
	C	20	5			2			2			1	1	1							7
	D	19	3					1	9						1	1			1		4
	E	19	1			5			1		3				3		1				5
	F	19	1	7		2	2				1						3				3
	G	19	1			11		3									2				2
	H	19	1	10											2						6
	I	19				1	5				1	4									8
	J	18		2				1	2	1				1	1		2	2			6
	L	16				1			6	4											5
	M	16	4			1			2			3		1					1		4
	N	16				3	2	1				1		2							7
	O	16	5					1	2										2		6
	Q_1	16	1		1	1		1				2		1							9
	Q_2	16	1	2	1			2						1	1						8
	Q_3	16	5			2			2								1				6
	Q_4	16	7			1			2							1	1				4
G (220)		300	63	23	21	17	2	7	7	19	18	2	4	6	11	0	5	5	7	3	80
C (202)		300	35	22	2	30	19	10	28	5	5	12	1	7	8	2	10	2	4	0	98
Total(422)		600	98	45	23	47	21	17	35	24	23	14	5	13	19	2	15	7	11	3	178

Table 35. Provisional titles assigned to 18 Promax factors and summaries of factor variances, numbers of salient items and numbers of marker items, by source.

Promax factor-Provisional Title	Variance			No. salients			No. markers		
	G	C	Tot.	G	C	T	G	C	T
1. Emotional Stability	17.24	10.64	27.87	95	67	162	63	35	98
2. Social Extraversion	6.16	6.88	13.04	35	39	74	23	22	45
3. Artistic Interest	7.65	1.82	9.46	25	8	33	21	2	23
4. Conscientiousness	4.05	4.97	9.01	30	45	75	17	30	47
5. Cyclothymia vs. Schizothymia	1.28	5.36	6.64	7	24	31	2	19	21
6. Agreeableness vs. Hostility	3.97	3.11	7.08	28	18	46	7	10	17
7. Relaxed Composure vs. Suspicious Excitability	2.79	5.85	8.64	21	38	59	7	28	35
8. Personal Relations	4.63	2.00	6.63	27	6	33	19	5	24
9. General Activity	4.81	2.37	7.18	29	9	38	18	5	23
10. Radicalism vs. Conservatism	1.20	2.18	3.39	8	26	34	2	12	14
11. Paranoid Sensitivity	1.89	1.48	3.36	10	5	15	4	1	5
12. Critical Thinking	2.99	2.67	5.66	18	16	34	6	7	13
13. Considerateness vs. Aggressive Disregard for Others	3.44	2.72	6.16	23	19	42	11	8	19
14. Dispositional Anxiety	1.21	1.41	2.63	9	8	17	0	2	2
15. Serious, Prudent vs. Happy-Go-Lucky, Impulsive	3.25	2.83	6.08	27	28	55	5	10	15
16. Empathic Meditation	2.34	1.82	4.16	14	5	19	5	2	7
17. Stoicism, Fear Denial vs. Weeping, Fear Proneness	2.42	1.87	4.29	13	11	24	7	4	11
18. Tolerance of Rough, Uncouth Behavior vs. Genteel, Proper, Refined	1.37	1.34	2.72	9	7	16	3	0	3
Total	72.69	61.32	134.01	428	379	807	220	202	422

titles, factor variances, numbers of salient items, and numbers of marker items, by Guilford and Cattell source.

Table 33 was compiled from the complete rotated factor matrix and is more extensive than the lists represented in the foregoing examination of items, which did not include items with lower loadings, around .20, in all cases, particularly the first few factors whose lists of salients were very long. Even though many of the factor loadings represented in this table are minor or secondary, in relation to loadings of the same items on other factors, the distributions in Table 33 nevertheless contribute important information concerning facets of the factors that are significant in their interpretation. This table can be compared with Table 34, which is restricted to the principal factor loading for each item, taking into account magnitude and also relative magnitude in the .20-or-over range; loadings below .20 are omitted arbitrarily.

The major source factor origins of each factor in the 18-factor Promax rotation are shown clearly in Table 33, but comparison of individual factor distributions in Tables 33 and 34 is revealing with respect to the differences in major and minor emphasis of particular source factors in the empirical factor structures. For example, the principal contributing Guilford factors to factor 1 in Table 33 are C, N, D, I, and O; in Table 34, C, N, and D remain highly represented, but I and O drop in relative influence. Source factor I retains its relative influence on factor 9; source factor O has no significant clusters on any factor other than factor 1. The principal Cattell factor contributors to factor 1 in Table 33 are Q_4, O, C, and D. All of these drop in Table 34, but Q_4, O, and C remain relatively high. At the same time, Q_3 shows no loss from Table 33 to Table 34 for the five items indicated on factor 1.

According to Table 33, 807 factor loadings of .20 or higher occurred on the 18 factors for the 600 items. Twenty-two Guilford items and 49 Cattell items failed to achieve loadings as high as .20 on any factor. Of the 807 salient loadings, 428 are for Guilford items and 379 for Cattell items, a ratio of about 53 to 47. Only two Guilford source factors have substantial numbers of items without any salient loadings; these are Ag with 4 of 16 and CC with 5 of 25. Cattell factors with substantial numbers of items that took no salient loadings include the following: E, 5 of 19; Q1, 6 of 16; Q_2, 6 of 16; L, 4 of 16; M, 4 of 16; and Q_3, 4 of 16.

Final Factor Identification-18 Factor Promax Rotation. The discussion in this section takes account of the content analysis, above, of salient items for each factor, as well as the data summarized in Tables 33, 34, and 35. Table 34 represents the final selection of items as markers for each of the factors. It is based on the abbreviated factor matrix shown in Appendix 3, which shows all factor loadings of .20 or higher.

Factor 1. EMOTIONAL STABILITY. This factor has been identified as T1 G1 C1, reflecting the congruence of the first factors in the independent factoring and rotation of the Total, Guilford, and Cattell matrices. The 98 markers identified by source factor in Table 34 and by item number and loading in Appendix 3 were selected from 162 salient items summarized in Table 33, on the basis of highest relative loading in the range of .20 or higher. The principal contributing source factors are Guilford's N, C, and D, which represent 42 of the 63 Guilford markers, and Cattell's Q_4, C, O, and Q_3, which represent 22 of the 35 Cattell markers. However, as noted previously in the analysis of the salient items for T1, the contributions of the remaining items from other source factors in both sets are significant in terms of homogeneity of content with the defining core.

The major themes identified in the analysis of item content of the T1 salients remain emphasized in the T1 markers. These are *tension*; *worry*, *depression*, *anxiety*; and *perseveration of ideas* and *fantasy*. The items counted as salients in Table 33, but eliminated from Table 34, are all somewhat related to these themes, but have salient loadings on other factors comparable to or higher than those on factor T1. These are illustrated by five Guilford I items and seven Cattell O items whose loadings are listed below:

I 368 (feel physically inferior to associates)1, .26; 6, .20
379 (confident in my abilities) 1, .28; 13, .29
381 (wish appearance were different) 1, .28; 11, .20; 15, .22
382 (wish to be more attractive) 1, .23; 15, .22
387 (people do not care for me) 1, .25; 11, .46; 15, .21
O 225 (downhearted if treated badly) 1, -.20; 7, -.39
228 (spirits high despite trouble)1, -.32; 7, -.38; 15, -.36
229 (shows excitement too obviously) 1, -.29; 13, -.24
230 (brought to tears easily) 1, -.21; 17, -.26
231 (worn out by excessive excitement) 1, -.23; 6, -.20; 9, -.21
232 (cries easily) 1, -.31, 17, -.53; 18, -.22
234 (fear of dark) 1, -.25; 17, -.23

None of these items has a high loading on factor 1, but each shows a relation to the core themes. At the same time, their relations to the other indicated factors are generally apparent, particularly I387, which has its major loading on T11 (Paranoid sensitivity), O225, which has its major loading on T7 (Relaxed composure vs. suspicious excitement), and O232, which has its major loading on T17 (Stoicism, fear denial vs. weeping, fear proneness). Of the 12 items listed above, only these three are retained in Table 34, as markers for other factors; the other nine were eliminated. Yet the nature of the relations among the traits is amply illustrated by the distribution of these low level factor loadings. Perhaps these could be dealt with more elegantly by skilled rotation; however, the detailed analysis of salients and markers, as in the present study, contributes greatly to the understanding of the factors.

Both the partial variances and the relative proportions of defining marker items, summarized in Table 35, suggest that factor T1 is accounted for by Guilford and Cattell source items in the ratio of about two-thirds to one third; nevertheless, both do contribute substantially to this factor.

Factor 2. SOCIAL EXTRAVERSION. This factor emerged second in the three principal factor analyses and the congruence among the three second factors (T2 G2 G2) was high. The major source factor contributors were Guilford' s S and A, which represent 19 and 7 items respectively in Table 33 and 16 and 3 in Table 34, and Cattell' s F and H, which represent 15 and 12 items respectively in Table 33 and 10 and 7 in Table 34. Guilford and Cattell items are about equally balanced among the salients in Table 33 and the markers in Table 34. The common themes of social initiative, ease, skill, and enjoyment of social interaction (including with the opposite sex), enjoyment of the limelight, having and making friends, outgoing behavior, happy-go-lucky mood, and enthusiasm, are expressed in the 45 marker items which define the factor.

Factor 3. ARTISTIC INTEREST. This factor, which appeared as T3 and G3, but not in the Cattell matrix, is perfectly defined in Table 34 by 20 Guilford AA items. The independence of the AA source factor is further exemplified by its dominance of Guilford supplementary factor 1.

Apart from the remarkable convergence of the 20 AA items on factor 3 in the Total matrix, the Guilford matrix, and on factor 1 in the residual Guilford matrix, which is important for the definition of the factor, these results have far greater implications for the present total study, with reference to the resolution of the factor structure of the 600 items by the methods used. Table 34 shows that only two Guilford source factors, AA (with 20 of 20) and N (with 16 of 19) and none of the Cattell source factors, have principal loadings on only one factor. Further, the same table shows that factor T3, discounting three small loadings, on Guilford's M, and Cattell's Q_1 and Q_2, and factor 18, which has only three markers, is really the only one among the factors derived in this study that is composed of items from a single source factor. Since the general results of this study characterize both the Guilford and Cattell source factors as largely :

heterogeneous in item content, and redistribute items among factors in frequent disregard of source factor labels, the integrity of the results involving the highly homogeneous group of 20 AA items in factor T3 must be respected.

Factor 4. CONSCIENTIOUSNESS. This factor, T4 G4 C3, is principally defined by Guilford source factor CC and Cattell source factor G, although five of the 17 Guilford markers are from other source factors (G, M, I) and 19 of the 30 Cattell markers are also from other source factors (C, E, F, I, L, M, N, Q_1, Q_3, Q_4). The homogeneity of item content for all 47 markers stands in interesting contrast to the heterogeneity of source factors from which the items were drawn. Nevertheless, the definitions of the two dominant source factors identify the core themes of this factor, which emphasize religion, moral standards and observance, use of discipline, propriety, respect for authority, conformity with social norms, rules, and niceties, respect for hard work, and serious thinking.

The frequencies marker items and salients for factor T4 can be compared easily in Table 35. For Guilford items, there were 17 markers and 30 salients, while the corresponding frequencies were 30 and 45 for Cattell items, and 45 and 74 for the two combined. The higher frequency of Cattell markers conforms with the somewhat higher variance component of Cattell items in factor T4, as compared with the Guilford component (Table 35). Nevertheless, this is considered a common factor with substantial contributions from both sources.

Factor 5. CYCLOTHYMIA vs. SCHIZOTHYMIA. Although not as spectacular as factor T3 G3 G-S1, this factor, designated T5 C4 C-S1, is the second to be accounted for principally by one source, this time the Cattell items. The total variance for T5 is 6.64, of which 5.36 is Cattell variance and 1.28, Guilford variance. The dominant source factor is Cattell's A, for which the factor is named; source factor A accounts for 10 of the 19 Cattell markers for this factor; only two Guilford markers appeared in relation to seven salients (Table 35). The defining items characterize this factor in terms of warmhearted, attentive to people, cooperative, expressive, outgoing vs. reserved, secretive, detached, impersonal, withdrawn, cool.

Factor 6. AGREEABLENESS vs. HOSTILITY. Factor 6, designated T6 C6, was identified as a Cattell factor by the analysis of congruence coefficients (congruence of T6 with C6, .94), but the Guilford component (3.97) of the variance of 7.08 in this factor is greater than the Cattell component (3.11), Table 35. As shown in Tables 33 and 34 there is no dominant source trait. There were more Guilford salients (28) than Cattell salients (18), Table 33, but more Cattell markers (10) than Guilford markers (7), Table 34. The largest shift was on Guilford factor Co, which had 7 salient items on T6, only two of which were retained as markers. Co is the dominant source factor for T8, but none of the other five Co salients is a marker for T8 or any other factor.

The title of T6 was taken from a study by Norman (1963), in which he obtained a similar factor based on trait ratings, whose descriptors, *good-natured vs. irritable*, *not jealous vs. jealous*, *mild, gentle vs. headstrong*, and *cooperative vs. negativistic*, express the core content themes of the T6 markers very accurately. Since this factor is based on items from 13 source factors (six Guilford and seven Cattell), none of which contributed over three markers, the use of a title descriptive of the content, but neutral in relation to the sources seemed most appropriate.

Factor 7. RELAXED COMPOSURE vs. SUSPICIOUS EXCITABILITY.

Factor 7 was tagged T7 G8 C8 C-S2. It is defined by 28 Cattell markers and 7 Guilford markers and the Cattell variance component (Table 35) is 5.85, in comparison with the Guilford component of 2.79 (total variance, 8.64). The dominant source factors are Cattell's D (Excitability) and L (Protension), which account together for 15 of the 28 Cattell markers. The defining items reflect central themes related to these two sources, particularly *emotionally mature vs. demanding, impatient*, *self-sufficient vs. attention-getting, exhibitionistic*, *deliberate vs. excitable, over-active*, *not easily jealous vs. prone to jealousy* , *trustful vs. suspicious*, and *composed, socially at ease vs. withdrawn*. The interpretive discussion of the relation of T7 to T6, in the analysis of T7 salient items, should be consulted to understand in detail the distinction between these two factors.

Factor 8. PERSONAL RELATIONS. Factor 8, designated T8 G7 G-S2, is principally a Guilford factor and consequently has been assigned a Guilford title. It is defined by 19 Guilford markers, 17 of which are from his source factor Co and by five Cattell markers, four of which are from his factor L. Although the defining items are predominantly drawn from one source factor, Co, the 17 Co markers were part of a set of 32 Co items used in the study, six of which are markers for other factors and the remaining nine omitted in Table 34. It was therefore to the item content rather than the Co source factor as an entity that we looked for interpretation of the factor. The core themes, of fault finding and deprecation of human nature are narrower than the complete range of Guilford's Co item reference of "cooperativeness with the environment." Since he has used the title Personal Relations more recently, in preference to Cooperativeness, this title was adopted for T8. The component variances for T8, which has a total variance of 6.63, are Guilford items, 4.63, and Cattell items, 2.00 (Table 35).

Factor 9. GENERAL ACTIVITY. This factor has been identified as T9 G6 C7 G-S3 and is principally a Guilford factor, defined by his source factor G. The total variance of 7.18 is divided between the Guilford and Cattell components in the amounts of 4.81 and 2.37, respectively, while the total of 23 markers represents 18 Guilford items, of which 10 are G items and 6, I items, and 5 Cattell items drawn from three source factors. All of the markers for T9 reflect clearly the concepts of rapid pace, energy, vitality, health, efficiency, liveliness, and enthusiasm, which define Guilford's factor G. Accordingly, the title, General Activity, has been retained.

Factor 10. RADICALISM vs. CONSERVATISM. This factor, bearing a Cattell title, has been tagged T10 C10 CS-3, and is defined principally by the Cattell definition of his source factor Q_1, even though only two of the 14 markers were drawn from that factor and four came from Cattell's factor I. This is clearly a Cattell factor; the total variance of 3.39 is broken down, 2.18, Cattell and 1.20, Guilford, and 12 of the 14 markers are Cattell items. The emphasis in the defining items is on behavior and ideas that are antitraditional, including antireligious, technically modern and efficient, and not necessarily "couth" or genteel or in accord with conventional moral values. Four salient Cattell A items, indicating a related tendency toward gregariousness, failed to hold up as markers on T10. This indicates an interesting association of T10, involving activities of a social nature, with people, as discussed earlier.

Factor 11. PARANOID SENSITIVITY. Identified earlier as T11 C9 this small factor, with a variance of 3.36, was regarded initially as a Cattell factor by virtue of a moderate congruence (.50) between T11 and C9. However, the Guilford component of the T11 variance is 1.89, which is greater than that of the Cattell component, 1.48, and four of the five marker items are Guilford items. The five markers, with their factor loadings, are as follows:

Guilford I387, feeling of rejection by others (.46)
O503, some people are intentionally trying to avoid me (.54)
Ag520, there are some people whom I would particularly like to put in their place
Co548, have been given a "raw deal" through spite (.31)
Cattell C31, some people annoy or avoid me, I don't know why (.54)

Themes of ideas of reference, feelings of rejection, low resistance to distraction, and rejection were identified in the 14 salient items discussed earlier. These are present in the five markers, but in view of the small number of significant markers, this factor cannot be considered well-defined.

Factor 12. CRITICAL THINKING. In the earlier discussion of T12 G10, this factor was described in terms of themes of (a) thoughtful and reflective, associated with altruistic and conscientious values, (b) self-sufficient and superior self-evaluation, and (c) critical attitudes. This analysis was based on 34 salient items, 18 from Guilford and 16 from Cattell. Only 13 of the 36 salients qualify as markers for this factor. These are as follows:

Guilford M350, more interested in intellectual things than athletics (.20)
T436, inclined to analyze motives of others (.55)
T437, try to find the underlying motives for actions of others (.46)
T438, often speculate on why people behave as they do (.37)
Co528, would change many things about human nature if permitted (.26)
Ag509, despises "yes men" (.25)
Cattell C34, critical of other people's work (.21)
J165, often take a lone stand in group discussions (.34)
M191, talk with ordinary, habit-bound people annoys me (.20)
N205, always keenly aware of propaganda attempts (.27)
N206, never fail to notice propaganda in things I read (.29)
$Q_1$237, considered a liberal dreamer of new ways rather than a practical follower of well-tried ways (.24)
$Q_2$253, prefers to work alone rather than with a committee (.25)

The themes listed above are apparent in these items, with the exception that superior self-evaluation is included by implication rather than explicit statement. Nevertheless, the title, Critical Thinking, is considered appropriate.

Factor T12 has a total variance of 5.66, which is almost equally divided between the Guilford and Cattell source items. The contributions of salients and markers are also about equally divided. Although the congruence analysis identified factor G10 as congruent with T12, the evidence suggests that T12 be regarded as a common factor. The dominant source factor among the salients was Guilford's T (Table 33), but in Table 34, the frequency of T items is too low for such identification.

Factor 13. CONSIDERATENESS vs. AGGRESSIVE DISREGARD OF OTHERS. Factor T13 was moderately matched with G12 in the congruence analysis and the discussion of T13 G12 included careful analysis of the relations between T13 and G12 as well as between T13 and T6 (Agreeableness vs. Hostility). It was pointed out that the content correspondence of T13 and G12 salients is high, while T13 differs from T6 in that the former is active, aggressive, uninhibited, and outgoing, while the latter involves self-oriented, passive satisfaction or dissatisfaction with people; both involve pleasant vs. unpleasant affect toward people and the environment, but they differ in behavioral characteristics.

Factor T13 has a total variance of 6.16, with 3.44 accounted for by Guilford sources and 2.72, by Cattell sources. The 42 salients were composed of 23 Guilford items, including eight A and six Ag items, and 19 Cattell items, of which six were from factor H (Table 33). The 19 markers (Table 34) include 11 Guilford and 8 Cattell items.

Factor 14. This factor was given a provisional title of Dispositional Anxiety in the earlier discussion. However, since it is defined by only two markers, Table 34, it must be dropped from further consideration in the present study. Factor T14 is smallest in variance (2.63) among the 18 factors in the Promax rotation. The list of salients examined previously may be regarded as the source of an interesting hypothesis for development and comparison with anxiety measures in the literature. However, in the present analysis the omission of this factor will do little violence to the emerging structure of personality based on the factors derived from the total matrix of 600 items.

Factor 15. SERIOUS, PRUDENT vs. HAPPY-GO-LUCKY, IMPULSIVE. The distinctiveness of this factor must be questioned in view of the fact that although 55 items are shown in Table 33 as salient, only 15 appear in Table 34 as markers. This factor was identified as mainly a Cattell factor by the congruence analysis, but the variance component accounted for by Guilford items is greater than the Cattell component (Table 35). On the other hand, the defining markers number 10 Cattell items and only five Guilford items. The two prominent source factors, Guilford's R and Cattell's F were analyzed in detail in the discussion of factor T15 G9 and it was concluded that both, but particularly F, are factorially complex, dividing between T2 and T15. The nature of the items retained as markers for T15 emphasizes the impulsive, daredevil, risk-taking aspect; however, further study of this factor is required to establish its identity with greater certainty.

Factor 16. The description of this factor (T16) on the basis of the 19 salient items is greatly weakened when the seven markers in Table 34 are examined. From the standpoint of the objectives of this study, it seems most appropriate to omit T16 from further consideration as a factor, although the sympathetic, empathetic forms of the remaining marker items may be worthy of further study.

Factor 17. STOICISM, FEAR DENIAL vs. WEEPING, FEAR PRONENESS. Although small in variance and defined by only 11 markers, this factor is distinct and clearly definable as a variable independent of other factors identified in this study. The relation to Guilford's M factor, discussed in relation to T17 and T18 is important to keep in mind. Although denial of fear and weeping behavior is associated with concepts of masculinity, the splitting up of the M items, as shown in Tables 33 and 34 is striking, and raises important questions concerning the unity implied by the common use of the term.

Factor 18. Factor T18 involved another group of Guilford M items, but of 16 salients, only 3 M markers remain in Table 34. The variance of T18 is only 2.72 and it is dropped from further consideration here, although further study appears to be warranted, in accordance with the earlier discussion of this factor.

Summary of Final Factor Identification. Of the 18 factors reviewed, only 10 or 11 appear to be well enough defined to be reported as well-established in this study. The factors that do not meet this standard, as discussed in the preceding paragraphs, are 11, 12, 14, 15, 16, 17, and 18. Of those retained, five can be considered as common to both sources, in terms either of balanced variance contributions to the factor or substantial contribution, particularly in the first two large factors; these are factors 1, 2, 4, 6, and 13. Factors 3, 8, and 9 are principally Guilford factors and factors 5, 7, and 10 principally Cattell factors. These are presented below as groups, with brief summary comments.

I. Factors Common to Both Guilford and Cattell Systems

1. Emotional Stability (T1 G1 C1)
   related to Guilford source factors N, D, C
   Cattell source factors Q_4, C, O, Q_3

2. Social Extraversion (T2 G2 C2)
   related to Guilford source factors S, A
   Cattell source factors H, F

4. Conscientiousness (T4 G4 C3)
   related to Guilford source factor CC
   Cattell source factor G

6. Agreeableness vs. Hostility (T6 C6)
   composed of items from 6 Guilford source factors
   7 Cattell source factors

13. Considerateness vs. Aggressive Disregard for Others (T13 G12)
   composed of items from Guilford source factors A, Ag, Co
   5 Cattell source factors

The summed variance of these five factors is 63.16, which represents 13 per cent of the total variance of the matrix and slightly less than half of the variance accounted for by the 18 factors.

Although related source factors are pointed out, particularly for factors 1, 2, and 4, it must be understood that the relationships implied are subject to qualification, as discussed below.

Factor 1. Sixteen of the 19 Guilford N items are indicated as markers for factor 1; the remaining three N items have no definitive loadings. However, factor 1 is defined by items from a total of 22 source factors and not uniquely by any one source factor. Source factors N, D, and C are the predominant Guilford contributors and Q_4, C, O, and Q_3, the most frequent Cattell contributors. It is significant that all of these, as defined by their originators, do represent specific facets of the general factor of Emotional Stability. It is also apparent that Guilford and Cattell, as well as Eysenck, Norman, and most other investigators who have reported factors in the subdomain of emotional stability, by a variety of titles, have been dealing with a common core of personality content. From the standpoint of this study, Guilford and Cattell have conceptualized the subdomain differently in their source factors; yet the two item pools converge on one factor, as demonstrated by the data for factor 1. It is believed that an important contribution made by this study is the demonstration of the unity of the items comprising the core, which appeared independently and was matched both statistically and by examination of item content, in the three major analytic phases. Whether to leave this domain unanalyzed, as Eysenck has apparently preferred, or to treat it as a higher order factor and attempt to reduce it to meaningful primaries, remains a question for further study.

Factor 2. The significant inputs to this second common factor, by Guilford's factor S (and A, as discussed earlier) and Cattell's H and F represent a second area of overlap between the two systems. Again, however, the present analysis failed to confirm the contributing source factors *in toto*, although the majority of S and H items are included. The interesting split of Cattell factor F has been pointed out previously in detail, as well as that of Guilford R, which has two markers on T2.

Factor 4. The convergence of Guilford factor CC and Cattell factor G was expected on the basis of the content analysis reported at the outset of this report. Although these two source factors are central in this factor, the recruitment of additional items with closely similar content, from 13 other source traits, as well as the shifting out of this factor of 13 of the 25 CC items and 8 of the 19 G items, reinforces the emphasis on item content mentioned frequently in this report. The location of the "disgust" cluster from Guilford's factor M in this "conformity-morality" subdomain, rather than in the "masculinity" domain was discussed in relation to the emphasis, in the military culture of the subjects in this study, on these behaviors as intrinsic to proper military bearing and appearance. The influence of cultural and situational norms on behavioral attitudes requires serious study in relation to assumptions concerning the invariance of personality traits.

Factor 6. This factor was interpreted entirely on the basis of item content and is unrelated to any dominant source factor. The title was appropriated from Norman (1963) on the basis of the similarity of item content to the trait rating descriptors used in his study. The discovery of this factor among the 600 Guilford-Cattell items analyzed is of interest methodologically. Both distinguished authors have developed trait systems which enjoy high status but at the same time require independent confirmation. Their continuing investigations have followed paths that focus on previous research and may be relatively less sensitive to durations from established structures. It is also possible that neither item pool included sufficient items related to the core of agreeableness vs. hostility to yield a nucleus of items of sufficient size to warrant consideration as a separate factor. In any case, the methods of objective, "blind" search, with an expanded item pool, in the present study, have yielded a new result of importance, which is common to the two sources, but has remained unrecognized in both.

Factor 13. Although 8 of the 20 Guilford A items are the dominant source of this factor, the interpretation was based on analysis of the item content of these and the 11 other markers, representing two other Guilford factors and five Cattell source factors. The distinction between factor 13 and factor 6, explained earlier, is important, but does not appear in either the Guilford or Cattell factor structures. Although a small factor, in terms of variance, factor 13 is clearly defined and identifiable by 11 Guilford markers and 8 Cattell markers.

II. Factors Identified as Primarily Guilford Factors

3. Artistic Interest (T3 G3 G-S1)
   based principally on the 20 items from Guilford factor AA

8. Personal Relations (T8 G7 G-S2)
   based principally on 17 items from Guilford factor Co

9. General Activity (T9 G6 C7 G-S3)
   based principally on items from Guilford factors G and I

Factor 3. As previously noted, this factor was the only one that reproduced one source factor completely and was not accounted for by any cluster of items from any other source factor, although one additional Guilford item and two Cattell items appear as markers. The source factor that accounts for factor 3 is Guilford's AA, whose content, related to literature, art, music, and drama is virtually discrete from that of all but a few of the other 580 items used in the study, as shown by the fact that, including the 20 AA items, there were only 33 salient items listed for factor 3 in Table 33. In view of the discreteness of the content of the AA items, in contrast to the heterogeneity of content of most other Guilford and Cattell source factors, the results for factor 3 are methodologically important in attesting to the analytic sensitivity of the statistical operations followed in this study.

Factor AA is not ordinarily regarded as a personality factor in the sense of personality style, as are the other factors in this study. However, this question is not at issue and must be deferred as not appropriate to the present report.

Factor 8. This factor is defined principally by 17 of the 32 Guilford Co items, but the interpretation of these items, along with seven other markers, is narrower than the range of the Co source factor as defined by Guilford. Six Co items appear as markers on five other factors and nine have no definitive loadings on any of the 18 factors.

Factor 9. Although there are 23 markers on this factor, it is well described by the 10 Guilford G items. Six Guilford I items are also prominent markers.

The three Guilford factors, together, have a summed variance of 23.27, which represents about four per cent of the variance of the 18 factors. The total of 23.27 is divided, 17.09 for Guilford items, and 6.19 for Cattell items.

III. Factors Identified as Primarily Cattell Factors

5. Cyclothymia vs. Schizothymia (T5 C4 C-S1)
   based principally on items from Cattell source factors A and I

7. Relaxed Composure vs. Suspicious Excitability (T7 G8 C8 C-S2)
   based principally on items from Cattell source factors D and L

10. Radicalism vs. Conservatism (T10 C10 C-S3)
    not clearly identified by a prominent source factor

Factor 5. Source factors A and I both contribute importantly to this factor, but the I items, as well as two Guilford M, two Cattell F, and two Cattell M items that constitute the remaining markers, could easily be considered A items in terms of content. Cattell's factor A well describes all of the marker items for this factor, even though four A items are markers for other factors.

Factor 7. The earlier discussion of this factor includes an analysis of Cattell's rationales for his factors D and L, which are the dominant source factors for factor 7. The distinction between these source factors in the present study is hard to grasp but the homogeneity of the marker items from these and 11 other source factors is striking.

Factor 10. As noted in the discussion of factor T10 C10 C-S3, the radicalism vs. conservatism reference of the 14 marker items for this factor, and indeed, the 34 salient items (Tables 33 and 34) is clear despite the fact that only two markers and three salients on this factor come from Cattell's source factor Q_1, which is his radicalism vs. conservatism factor. The designation of this factor by the title given is based on item content, although the variance components and congruence coefficients clearly identify T10 as a Cattell factor.

The three Cattell factors, together, have a summed variance of 18.67, which represents about three per cent of the variance of the 18 factors. Of this, 13.39 is accounted for by Cattell items and 5.07, by Guilford items.

RELATIONS OF SOURCE FACTORS TO EMPIRICAL FACTORS

Notwithstanding the conclusion, mentioned repeatedly in the foregoing discussions, that the Guilford and Cattell source factors are generally heterogeneous in respect to item content, it is nevertheless important to review the two sets of source factors in terms of their contributions to the 18 factors. For this purpose, a source factor is considered involved in a factor if a substantial number of its items are listed as markers for that factor.

Guilford Source Factors

Of the 15 source factors representing the Guilford trait system, 9 were significantly involved in 1 or more of 7 of the 18 factors in this study; 2 had small clusters on each of 2 factors; 1 was split up among 11 factors; and 2 were not clearly aligned with any factor. The factor alignments and other comments related to factor alignment are shown below. The 15 source factors are listed in the order in which they are listed in Appendix 2.

Source factor G-General Activity-Factor 9-General Activity

10 of 14 G items are defining markers for this predominantly Guilford factor.

Source factor A-Assertiveness-Factor 13-Considerateness vs. Aggressive Disregard for Others

8 of 20 items comprise the salient, but not defining cluster on this factor which is common to both sources.

Source factor M-Masculinity-no definite factor alignment

23 of the 30 M items appear as markers on 11 different factors; the largest cluster, of 7 items, is on factor 17.

Source Factor I-Inferiority-no definite factor alignment

two groups of I markers were found; one with 5 items on factor 1, a factor common to both sources, and one with 6 items on factor 9-General Activity, a Guilford factor defined by items from source factor G.

Source Factor N-Nervousness-Factor 1-Emotional Stability

16 of the 19 N items are markers for factor 1; the remaining 3 items had no principal loadings; the N items combine with Guilford D and C and Cattell Q_4, C, O, and Q_3 to define factor 1.

Source factor S-Sociability-Factor 2-Social Extraversion

16 of the 21 S items are defining markers for factor 2, along with 10 of 19 Cattell H items and 7 of 19 Cattell F items; two S items were markers for factor 1 and three had no principal loadings.

Source factor T-Thoughtfulness-no definite factor alignment

only 6 T items had principal loadings; two on factor 1, three on factor 12, and 1 on factor 16.

Source factor D-Depression-Factor 1-Emotional Stability

10 of the 14 D items comprise a second defining group of markers for factor 1; one D item is a marker for factor 7 and the remaining three had no principal loadings.

Source factor C-Cycloid Personality-Factor 1-Emotional Stability

16 of the 21 C items comprise a third defining group of markers for factor 1; two C items are markers for factor 7 and the remaining three have no principal loadings.

Source factor R-Restraint-no definite factor alignment

10 of the 17 R items are divided as markers for three factors, four for factor 1, two for factor 2, and four for factor 15; although factor 15 was not considered clearly established, the discussion pointed out that both R and Cattell's F are split in content as well as in factor alignment of items, R between factors 1 and 15 and F between factors 2 and 15.

Source factor O-Objectivity-no definite factor alignment

10 of the 16 O items are divided as markers among four factors; the largest group, of six, is on factor 1; the others include 1 for factor 7, 1 for factor 11, and four for factor 15; six O items have no principal loadings.

Source factor Ag-Agreeableness–no definite factor alignment

8 of the 16 Ag items are distributed as markers for six factors, as follows: factor 6, one, factor 7, two, factor 8, one, factor 11, one, factor 12, one, and factor 13, two; 8 other Ag items have no principal loadings.

Source factor Co-Cooperation with the Environment-Factor 8-Personal Relations

17 of the 32 Co items comprise the defining group for factor 8, a Guilford factor; one Ag and one CC item, along with one Cattell J and four Cattell L items make up the remaining markers; six other Co items are markers for five other factors: factor 6, two, factor 10, one, factor 11, one, and factor 12, one; nine Co items have no principal loadings on any factor.

Source factor AA-Artistic Interest-Factor 3-Artistic Interest

all 20 of the 20 AA items are the defining markers for this factor; only three other items, one Guilford M, one Cattell Q_1, and one Cattell Q_2, each with specific artistic content, appeared as markers for this factor.

Source Factor CC-Cultural Conformity-Factor 4-Conscientiousness

12 of the 25 CC items, along with 11 of the 19 Cattell G items, define this common factor; four other CC items are markers for these other factors: factor 6, one, factor 8, one, and factor 9, two; nine CC items had no principal loadings on any factor.

Cattell Source Factors

Eleven of the 17 Cattell source factors are similarly aligned with six of the 18 empirical factors. As seen in Tables 33 and 34, the Cattell items were found to distribute over the range of factors to a greater extent than the Guilford items. Further, it is apparent that the source factor groups of Cattell markers on the 18 factors represent smaller proportions of the original source factor samples than we have seen for the Guilford items. This is unquestionably a reflection of the different strategies of Cattell and Guilford with respect to item density in factor composition, discussed in the introductory section of this report, but at the same time it must be remembered that our analysis of the items determined as markers for the various factors revelaed much content homogeneity of items, drawn from a variety of source factors, that converged on the present empirical factors. While true of both the Guilford and Cattell items, this tendency was greater for the Cattell items.

Source factor A-Cyclothymia vs. Schizothymia-Factor 5-Cyclothymia vs. Schizothymia

> 10 of 20 A items define factor 5, along with five Cattell I items and six other items, representing Cattell F (two) and N (two) and Guilford M (two); two other A items are factor markers, one for factor 3 and one for factor 10; the remaining eight A items have no principal loadings on any factor.

Source factor C-Ego Strength-Factor 1-Emotional Stability

The convergence of C, Q_4, O, and Q_3 items on factor 1 is of much interest since these source factors, along with L and H are regarded by Cattell as the components of his second-order Anxiety factor (Cattell, 1965). It is not possible to dismiss factor 1 as the equivalent of this second-order factor, however, for at least three reasons. These are: (1) The proportions of C, Q_4, O, and Q_3 markers on factor 1, in relation to the respective source factor samples, are small, while at the same time each of these source factors contributed markers to other factors, as shown in Table 34. (2) Source factor L has no markers for factor 1 and H, which is heavily involved in factor 2, has only one. (3) Factor 1 is represented by 35 Cattell markers; of these, 23 were drawn from C, Q_4, O, Q_3, L, and H, while the remaining 12 represent seven other Cattell source factors. As alternatives to the second-order Anxiety factor interpretation, two other hypotheses seem to merit consideration. The first is that factor 1 is a discrete factor, judged in terms of item homogeneity. This, of course, applies to the Guilford items as well, which involve his factors N, D, C, and items from six other Guilford factors. The second alternative, which remains an empirical question at this time, is that the pool of 162 salient items for factor 1 or even the reduced pool of 98 factor 1 markers, if factored separately, might yield a new set of primary factors, organizing the domain represented by factor 1 into smaller meaningful units, but different from those presently set forth by Guilford and Cattell. Norman's (1963) research on trait ratings, as well as that of Tupes and Christal (1961), supports the first of these hypotheses.

Five of the 20 C items are markers for factor 1; two each are markers for factors 4 and 7, and one each, for factors 10, 11, 12, and 17; seven C items had no principal loadings on any factor.

Source factor D-Excitability-Factor 7-Relaxed Composure vs. Suspicious Excitability

Nine ~~of~~ 19 D items are markers for factor 7; 3 D items are markers for factor 1, and one each for factors 6, 13, and 14; four are not markers for any factor and two failed to be listed as salients on any factor. Factor D has been reported in a number of Cattell's studies (Cattell, 1957), but is not included in his popular-questionnaire, which also omits factor J. The performance of factor D in the present study is striking in comparison with some others, considered better established by Cattell, such as E, M, N, Q_1, and Q_2, although in a recent paper, Cattell, Eber, and Delhees (1968) have noted weaknesses in the definition of these factors, too.

The contribution of the nine D items to factor 5 is made in association with five (of 19) Cattell I items, as well as two Guilford M items and two each from Cattell's F and N.

Source factor E-Dominance-no definite factor alignment

Fourteen of the 19 E items are distributed as markers over six factors as follows: one on factor 1, five on factor 4, one on factor 7, three on factor 9, three on factor 13, and one on factor 15; five E items had no principal loadings on any factor. The failure of Cattell's E to align with Guilford's similarly named factor A was a surprise at first, but was cleared up by examination of item content. Neither of these factors represented its title adequately in the present study.

Source factor F-Surgency-Factor 2-Social Extraversion

The results of the present study revealed a split in source factor F between items reflecting outgoing, warm, sociable tendencies, which aligned with factor 2, and other reflecting serious, prudent vs. impulsive tendencies, that aligned with factor 15. This was suggested first by the factor loadings of the F items and is supported by examination of item content; however, in addition to the seven F markers on factor 2 and 3 on factor 15, two F items each are markers on factors 4 and 5 and one each, on factors 1 and 9; three of the 19 F items have no principal loadings on any factor.

The F contribution to factor 2 is subordinate to that of Cattell factor H and, indeed, the seven F markers on factor 2 might better be transferred to H than remain where they are.

Source factor G-Superego Strength-Factor 4-Conscientiousness

The neat fit of source factor 4 with Guilford's CC on factor 4 was rewarding in relation to our initial content analysis of the respective items. These two source factors define factor 4 quite well.

Eleven of the 19 G items are markers for factor 4; G items appear also as markers for factor 1 (one), factor 6 (three), and factor 15 (two); only two have no principal factor loadings. The results for factor G are comparable with those for factors A and H in confirmation of particular Cattell source factors.

Source factor H-Adventurousness-Factor 2-Social Extraversion

Ten of the 19 H items are markers for factor 2 and define the factor along with the 16 Guilford S items; one H item is a marker for factor 1, and two are markers for factor 13; the remaining six have no principal factor loadings.

The convergence of H and S on factor 2 is another good match; even though nine H items and three S items fell short of acceptance as markers, the numbers listed as salients on this factor were 15 for H and 19 for S; there were also 12 Cattell F salients on factor 2.

Source factor I-Tender vs. Tough-no definite factor alignment

Source factor I had its major cluster on factor 5, in association with A, which defined that factor; it also contributed four of its 19 items to factor 10 (Radicalism vs. Conservatism) and had one marker on factor 4. The expected convergence with Guilford's M failed to materialize when M split up, as discussed above.

Source factor J-Coasthenia vs. Zeppia-no definite factor alignment

Twelve of the 16 J items are distributed as markers over eight factors, as follows: two each on factors 2, 7, 15, and 16, and one each on factors 6, 8, 12, and 13; six had no principal factor loadings.

Source factor L-Trusting vs. Suspicious-Factor 7-Relaxed Composure vs. Suspicious Excitability

Six L items (out of 16) in conjunction with nine Cattell D items, as discussed above, constitute the defining markers for factor 7. The remaining L items are distributed as follows: one is a marker for factor 4 and four, for factor 8; the remaining five have no principal factor loadings.

Source factor M-Conventional, Outer-Directed vs. Bohemian, Inner-Directed-no definite factor alignment

The largest cluster, of four of the 16 M items, is on factor 1; eight other M items are markers, one on factor 4, two on factor 7, three on factor 10, one on factor 12, and one on factor 17, while 4 have no marker affiliations. The three M markers on factor 10 define radicalism vs. conservatism more accurately than the distinction implied in the title of source factor M.

Source factor N-Simple, Artless vs. Shrewd, Calculating-no definite factor alignment

Nine of the 16 N items are markers, three on factor 4, two on factor 5, two on factor 12, and one each on factors 6 and 10; seven had no principal factor loadings.

Source factor O-Guilt Proneness-Factor 1-Emotional Stability

Despite the fact that factor O is mentioned prominently as an anxiety indicator in diagnostic used of the 16 PF test, only five O items clustered as markers on factor 1, while two each appeared as markers on factors 7 and 17, one on factor 6, and 6 had no principal factor loadings. The present results suggest that a nucleus of valid items exists on this factor, but that its independence is in question.

Source factor Q_1-Conservative vs. Radical-no definite factor alignment

Notwithstanding the discovery of a clearly defined factor (factor 10) corresponding in item content to the definition developed by Cattell for his factor Q_1, it was surprising that only two of the 16 Q_1 items came out as markers for factor 10, while Cattell's factor I contributed four. Nine of the 16 Q_1 items were without principal factor loadings; the remaining five were distributed, one each, over factors 1, 3, 4, 6, and 12.

Source factor Q_2-Group-dependant vs. Self-sufficient-no definite factor alignment

Factor Q_2 turned out to be as scattered as Q_1; eight of its 16 items had no principal factor loadings; the eight identified as markers were distributed, two each on factors 2 and 6, and one each on factors 1, 3, 12, and 13.

Source factor Q_3-Casual vs. Controlled-Factor 1-Emotional Stability

A cluster of five Q_3 markers out of 16 source factor items is the basis for identifying Q_3 as a contributor to factor 1. Five other items are markers, two each on factors 4 and 7, and one on factor 15, while six are unaffiliated.

Source factor Q_4-Ergic Tension-Factor 1-Emotional Stability

It was expected that source factor Q_4 would be the strongest component of a factor in the emotionality domain within the Cattell system. It is, although only seven of the 16 Q_4 items qualified as markers on factor 1 (out of 12 salients). Two Q_4 items are markers for factor 7, one each for factors 4, 14, and 15, while four are unaffiliated.

CONCLUDING DISCUSSION AND SUMMARY

The magnitude of this study and the massive amount of data and detail involved created problems, not only of method, but also of effective communication in reporting. The methodological decisions necessitated by the sheer size of the project have been reported as faithfully as possible to assist the critical reader in evaluation and the availability of the basic data, correlation matrices, unrotated and rotated factor matrices, as well as other supporting and related intermediate data and computer output for the use of other qualified investigators has been provided for in the interest of the scientific objectives of the research.

The principal methodological effect of the large-scale computational problems, apart from difficulties encountered in programming the analyses for available computer equipment, was a number of compromise decisions in which procedures were adopted that took feasibility into account, after consideration of alternatives available. Perhaps the most important of these involved communalities and rotation. The communality values entered into diagonals were the largest correlation coefficients in the respective arrays; computations required for alternative procedures would have incurred prohibitive costs. Consideration was given to the use of Eber' s (1966) Maxplane rotation method, for the oblique rotations; this, too, was regarded as infeasible within the limitations of time and resources available.

The writers have attempted to provide readers of the report with information essential to a critical understanding of method and results, but at the same time to avoid overwhelming them with the massive volume of computer output produced. In addition to the thiry-five tables included in the text and the three appendices, presenting (1) test forms and answer sheets, (2) items organized by source factor and cluster, and (3) the 18-factor Promax matrix, showing factor loadings of .20 or higher for all 600 items, additional information is included in Appendices 4 and 5 on the Promax factor loadings for the 12 Guilford and 11 Cattell factors; in Appendix 6, on the cluster correlations of empirical factors with source factors; in Appendix 7, on the distributions of salient item factor loadings by source factor; and in Appendix 8, on the intercorrelations among the 18 Promax factors. It was considered impractical to incorporate discussion of these additional tabular summaries in the report. However, those who wish to take time to examine these data in detail will find that they support the information included in the main body of the report. A supplementary section will summarize the results for the eight supplementary Guilford factors and the seven supplementary Cattell factors; these are in general of subordinate importance to the major results incorporated in the main body of the report.

Design. This study involves a series of independent factor analyses and rotations of 300 Guilford items, provided as markers for 15 Guilford source factors and 300 Cattell items, provided as markers for 17 Cattell source factors. Randomly organized booklets, adapted for optical scanning and automatic card punching of answer sheet responses were employed in the administration of these items to a sample of 2501 basic airmen at Lackland Air Force Base. The answer sheets of 2201 subjects who completed at least 570 items, without runs or other deviation from instructions were retained for analysis.

The analyses consisted of the following phases:

I. Principal factor analysis of the 600 x 600 matrix, with Varimax and Promax rotation of one set of 15 factors and one set of 18 factors, independently. All subsequent factor matrices were also rotated by Varimax and Promax programs. Factors derived from analysis I were designated by the initial T, for Total matrix.

II a. Principal factor analysis of the Guilford (G) 300 x 300 matrix. Twelve factors were rotated by both programs and factor loadings were estimated for Cattell items by the Dwyer extension.

II b. Principal factor analysis of the Cattell (C) 300 x 300 matrix. Eleven factors were rotated by both programs and factor loadings were estimated for Guilford items by the Dwyer extension.

III a. Computation of a residualized Guilford matrix by partialling out variance accounted for by Cattell items, principal factor analysis of the residual matrix, rotation of eight factors by both programs, and estimation of factor loadings for Cattell items by the Dwyer extension.

III b. Computation of a residualized Cattell matrix by partialling out variance accounted for by Guilford items, principal factor analysis of the residual matrix, rotation of seven factors by both programs, and estimation of factor loadings for Guilford items by the Dwyer extension.

The results of these analytic phases produced 142 factors, as follows:

I. 15 Varimax T factors + 15 Promax T factors
18 Varimax T factors + 18 Promax T factors

II a. 12 Varimax G factors + 12 Promax G factors

II b. 11 Varimax C factors + 11 Promax C factors

III a. 8 Varimax G-S factors + 8 Promax G-S factors

III b. 7 Varimax C-S factors + 7 Promax C-S factors

Following completion of these analyses, all "blind," in the sense that they were performed in series by the computer without any reference to item designations or content, following predetermined program instructions for decisions concerning cessation of factoring and of rotation, congruence coefficients were computed among all 142 factors and cluster correlation coefficients were computed between each of the empirical factors and the source factor item clusters.

Analysis of Results. The interpretation of the factors, as reported in the preceding pages of this report, utilized the congruence and cluster correlation coefficients to identify matching factors within and across analyses and to identify associations between empirical and source factors before any items were examined. Very high congruence was found between Varimax and Promax results, but the Promax results were used in the final factor interpretation because of lower variances on the early, large factors. For the Total matrix, the first 12 factors of the 15 and 18 factor rotations were closely matched; the 18 factor results were selected for interpretation in an effort to explore as wide a range of factors as possible.

Although interpretive hypotheses, based on factor matching and examination of item content, were readily suggested, using as a basis salient items with factor loadings of .20 or higher on every factor, seven of the 18 factors were considered inadequately established in terms of variances and numbers of marker items, with non-duplicating principal loadings of .20 or higher on one factor.

Of the 11 factors retained, five were judged to be common to both the Guilford and Cattell structures, three to be principally accounted for by Guilford items, and three to be principally accounted for by Cattell items.

Conclusions. The present study is the only one known to the authors in which a major analysis of personality factors has been carried out at the level of individual items. Apart from cost, large-scale computers and computer programs to work with matrices of 600 items have only recently become available. Guilford's factor analyses have been based principally on homogeneous item clusters and Cattell's more recent work (Cattell and Gibbons, 1968; Cattell, Eber, and Delhees, 1968) involves the use of "parcels" of items, the homogeneity of which is not subject to check. In the present study, the correlations among items and the factored and rotated results, domonstrated beyond question, that analysis at the item level is highly destructive to the factors previously assembled with inadequate concern for their loadings in large matrices in which a wide range of factors is known to exist. The results, for all but one empirical (T3) factor and for all but two source factors (Guilford's AA and N) were essentially content heterogeneous. At the same time, the convergence of all 20 AA items as unique markers for factor T3, which matched closely with factor G3 and with factor G-S1, demonstrates that the heterogeneity should not be dismissed as an anomolous result, but rather that it reflects the nature of the item composition of the source factors, which have apparently gone unchallenged for many years.

If the results are accepted, the indications for reclassification of at least 400 of the 600 items included in the study are obvious. In support of the strong belief that further progress in the development of factored personality questionnaires must begin with refinement and improvement of the item pools, the discussions of individual factors have been documented by reference to item content. Whether or not these results lead to revision of current personality questionnaires will depend in part on the credence given to the results. There are, as pointed out, numerous indications for further research as a result of the reorganizations of items indicated. It is hoped that one direction of such research will incorporate the new groupings of items indicated in validation studies using independent criteria for the newly assembled scales.

REFERENCES

Burt, C. The factorial study of temperamental traits. British Journal of Psychology, Statistical Section, 1947, 1, 3-26.

Cattell, R. B. Personality and Motivation Structure and Measurement. New York: Harcourt, Brace, World, Inc., 1957.

Cattell, R. B. The Scientific Analysis of Personality. Baltimore: Penguin Books, Inc., 1965.

Cattell, R. B. The Scree Test for the number of factors. Multivariate Behavioral Research, 1966, 1, 245-276.

Cattell R. B., Eber, H. W., and Delhees, K. H. A large sample cross validation of the personality trait structure of the 16 P.F. with some clinical implications. Multivariate Behavioral Research, Special Issue, 1968, 3, 107-131.

Cattell, R. B. and Gibbons, B. D. Personality factor structure of the combined Guilford and Cattell personality questionnaires. Journal of Personality and Social Psychology, 1968, 9, 107-120.

Dwyer, P. S. The determination of the factor loadings of a given test from the known factor loadings of other tests. Psychometrika, 1937, 2, 173-178.

Eber, H. W. Toward oblique simple structure: Maxplane. Multivariate Behavioral Research, 1966, 1, 112-125.

Gibbons, B. D. A study of the relationships between factors found in Cattell's 16 P.F. questionnaire and factors found in the Guilford personality inventories. Unpublished doctoral dissertation. University of Southern California, 1966.

Guilford, J. P. Personality. New York: McGraw-Hill Book Company, Inc., 1959.

Guilford, J. P. and Zimmerman, Wayne S. The Guilford-Zimmerman Temperament Survey. Manual of Instructions and Interpretations. Beverly Hills, Calif.: Sheridan Supply Company, 1949.

Guilford, J. P. and Zimmerman, Wayne S. Fourteen dimensions of temperament. Psychological Monographs, 1956, 70, Whole No. 417.

Guilford, J. P., Christensen, P. R., and Bond, N. A. The DF Opinion Survey. Manual of Instructions and Interpretations. Beverly Hills, Calif.: Sheridan Supply Company, 1956.

Harman, Harry H. Modern Factor Analysis. Rev. Second Ed. Chicago: University of Chicago Press, 1967.

Hendricksen, Alan E. and White, Paul Owen. Promax: A quick method for rotation to oblique simple structure. British Journal of Statistical Psychology, 1964, 17, 65-70.

Institute for Personality and Ability Testing. The 16 PF Test. Manual. Champaign, Illinois, 1956.

Kaiser, Henry F. Computer program for Varimax rotation in factor analysis. Educational and Psychological Measurement, 1959, 19, 413-420.

Norman, Warren T. Toward a taxonomy of personality attributes: Replicated factor structure in peer nomination personality ratings. Journal of Abnormal and Social Psychology, 1963, 66, 574-583.

Overall, John E. and Porterfield, J. L. Powered rector factor analysis. Psychometrika, 1963, 28, 415-422.

Sells, S. B. Essentials of Psychology. New York: The Ronald Press Company, 1962.

Tucker, Ledyard, R. A Method for Synthesis of Factor Analysis Studies. Washington, D.C.: Department of the Army, Personnel Research Section Report No. 984, 1951.

Tupes, Ernest C. and Christal, Raymond E. Recurrent Personality Factors Based on Trait Ratings. Lackland Air Force Base, Texas: Personnal Laboratory, Techincal Report No. ASD-TR-61-97, 1961.

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APPENDIX 1

COPIES OF TEST BOOKLETS AND ANSWER SHEETS

APPENDIX 3

ABBREVIATED FACTOR MATRIX, 18-FACTOR PROMAX ROTATION

Item numbers correspond to Appendix 2. Principal factor loadings are underlined; only loadings of .20 or higher are included. Decimal points are omitted.

Source	Item	Factor Number																	
Factor	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	1					51													
	2					41													
	3					69													
	4					39													
	5					63					22						-20		
	6					36					38								
	7					60													
	8					62													
	9	none																	
	10		31								30								
	11													-24					-22
	12		24				20												
	13		27																
	14		24								34								
	15	none																	
	16					37													
	17			-33		31					23								
	18					21													
	19					32													
	20		25					-20						-23					
C	21	none																	
	22																	31	
	23	20								33									
	24	32								39						20			
	25	32																	
	26						-21	24											
	27										-21								
	28	40																	
	29							45											
	30	24																	
	31	32										54		25					
	32	none																	
	33				29			40											-26
	34												-21						
	35																	26	
	36	none																	

Source Factor	Item No.	Factor Number																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C	37	63														21			
	38	39														22			
	39				-36								-24						
	40				-20														
D	41							-44											
	42	-27						-29											
	43	-29						-44											
	44							-26											
	45							-54											
	46							-20											
	47							-33		-25		24							
	48													-27					
	49							-37											
	50							-30											
	51	-26					-20												
	52						-21												
	53	none																	
	54	-22																	
	55	none																	
	56	-26													64			-28	
	57	-33																	
	58	-26																	
	59							-29											
E	60									35			27		-26			-21	
	61									25									
	62											-21		-28					
	63	-27																	
	64				21														
	65													-44					
	66						23												
	67	none																	
	68	none																	
	69															20			
	70	none																	
	71									28									
	72	none																	
	73				21														
	74				41														
	75				71						47								-32
	76				44														
	77	none																	
	78													-21					

Source	Item	Factor Number																	
Factor	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
F	79				20											51			
	80															25		22	
	81		43													40			
	82															30			
	83		52																
	84		49								23					29			
	85		62								26					23			
	86		24		-22					35									
	87		38																
	88				28														
	89		36					27								78			
	90		67													31			
	91		38										-23						
	92	-26	30																
	93	27																	
	94		23		33														
	95			20		39													
	96					25													
	97	21	38																
G	98						34												
	99				-41														
	100	none																	
	101						32												
	102				-22														
	103				-24														
	104															-21			
	105				-25														
	106				-31														
	107				-51						-43								
	108						37												
	109				-37														
	110				-39														
	111				-57						-25								
	112				-21														
	113	31																	
	114	none																	
	115				38														
	116				-28		20									-40			
H	117		39											-26					
	118		36																
	119		59																
	120	51	22											-20					

Source Factor	Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
										Factor Number									
H	121	21	30											-20					
	122		42		-21														
	123		50																
	124	21	38											-26					
	125													-47					
	126	25	41																
	127		26												-24	22			
	128	none																	
	129													-27					
	130							24								22			
	131		22											-21					
	132		27																
	133		22										23						
	134		44																
	135		24		-20														
I	136			21									22						
	137			20			20												
	138	-25								25			26						
	139	none																	
	140				-22														21
	141				-29						-57								
	142				-21						-35								
	143					68													
	144			20		37													
	145					23					24								
	146				-30						-38							-20	
	147					64													
	148					50													
	149					51					-22								
	150				22														
	151						23									-20			
	152									-58									
	153				-31						-37								
	154	none																	
J	155							-28								-20			
	156	none																	
	157								44										
	158							-34											
	159	none																	
	160							-46											
	161																34		
	162																28		

Source Factor	Item No.	Factor Number																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
J	163		-37																
	164															-23			
	165												34						
	166		-36																
	167		-23								-21								
	168													27					20
	169	none																	
	170						-20												
	171															-25			
	172	none																	
L	173							-21											
	174	none																	
	175		-24					-33								-25			
	176							-27									20		
	177							-44											
	178	none																	
	179													-25					
	180							-37						-20					
	181							-39											
	182								26										
	183								20										
	184								52										
	185								41										
	186	none																	
	187	none																	
	188				-21														
M	189							-41						-24					
	190	none																	
	191												20						
	192							-31											
	193	-29																	
	194	-42																	
	195	none																	
	196				-27						-37								
	197																	-25	
	198										-21								
	199	-25																	
	200	none																	
	201			33		-34					-40								
	202				51						31								
	203	none																	
	204	-23																	

Source Factor	Item No.	Factor Number																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
N	205												27						
	206	23											29			-20			
	207				32														
	208			24			-23												
	209				30						36								
	210	none																	
	211	none																	
	212					33													
	213	none																	
	214	-21						-20											
	215				-28														
	216				25													-20	
	217	42																	
	218					26													
	219						-24												
	220				21														
O	221	-42	-24																
	222	-39													21				
	223	none																	
	224	-39																	
	225	-20						-39											
	226							-49											
	227						-32												
	228	-32						-38								-36			
	229	-29												-24					
	230	-21																-26	
	231	-23					-20			-21									
	232	-31																-53	-22
	233	-66														-28			
	234	-25																-23	
	235	-44																	
	236	none																	
Q_1	237												24						
	238	none																	
	239												23				24		
	240	none																	
	241				33														
	242						-23												
	243			28															
	244										21		20						
	245										21								
	246	none																	

Source Factor	Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Q1	247										26								
	248	32																	
	249	none																	
	250	none																	
	251	none																	
	252					-25							26						
Q2	253												25						
	254	none																	
	255	30											26	-33					
	256	27					22												
	257	none																	
	258	none																	
	259	none																	
	260	none																	
	261		-46																
	262	24																	
	263	-21	-24																
	264		-31							-20			-21						
	265						38												
	266						20												
	267			33															
	268	none																	
Q3	269															-25			
	270	none																	
	271	34																	
	272				-21														
	273	none																	
	274				-21														
	275							42					-22						-22
	276	46													-22				
	277							34	23										
	278			32	-23														
	279	40						20											
	280	23																	
	281	none																	
	282	38																	
	283							20								20			
	284	none																	
Q4	285	-45																	
	286	33															-26		
	287	-34																	
	288	-29													20				

Source	Item	Factor Number																	
Factor	No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Q$_4$	289	-52																	
	290							-33											
	291							-43											
	292							-23								-31			
	293	-59														-21			
	294	-44																	
	295	-26													21				
	296	-20													67			-28	
	297	-26										-21							
	298	-59								-25									
	299	-46																	
	300				-20														
G	301									57									
	302									46									
	303									27									
	304									55									
	305									27									
	306									44									
	307	-31																	
	308									44						25			
	309	20								59									
	310									39									
	311						20												
	312		32																
	313									34									
	314									29			28						
A	315	23	21																
	316		23												-20	-24			
	317												25	-42					
	318													-41					
	319	22						-23						-29					
	320													-46					
	321													-25					
	322													-46					
	323													-47					
	324	24						-20						-39					
	325	24												-20					
	326	none																	
	327	none																	
	328		31																
	329		25																
	330		65													20			

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	331	none																	
	332	22																	
	333		26																
	334		24																
M	335																	34	
	336									22						34			
	337																	31	
	338																	26	
	339																	40	
	340																	39	
	341	26																57	21
	342	25																41	
	343	none																	
	344	39																39	
	345					-35													
	346					-24												22	
	347					-33													
	348				-20													26	
	349					-21	30												
	350			-21						20			-35						
	351			-35															
	352		-29								-22								
	353					-24												21	
	354		-38																
	355			-30		-26					35								
	356				20			20											-36
	357				35														-31
	358				36			26											-40
	359				25			23											-32
	360				78						50								-42
	361				48						20								-30
	362																-30		
	363	none																	
	364				23												-39		
I	365	36																	
	366									48									
	367									26									
	368	26					20												
	369									26									
	370									40			29		-21			-21	
	371						-25			24									
	372						22												

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
I	373	30																	
	374									24									
	375							20											
	376	none																	
	377	52																	
	378									22									
	379	28												29					
	380	none																	
	381	28										20				-22			
	382	23														22			
	383				-20														
	384	none																	
	385		24							23									
	386	43												-23					
	387	25										46		21					
	388	40					20												
N	389	29																	
	390	-59														-22			
	391	-27																	
	392	-53													22				
	393	-28																	
	394	-26																	
	395	-31																	
	396	-40																	
	397	-37																	
	398	none																	
	399	-29																	
	400	-27						-26				21							
	401	-42																	
	402	-59						-28											
	403	-21																	
	404	-31																	
	405	-35								-20			23						
	406	-48								-25			24						
	407	-57								-25									
S	408		29																
	409		41									20							
	410		48																
	411		30							28									
	412		62													26			
	413		43							21									
	414	51												-24					

Source Factor	Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
S	415		25																
	416	45																	
	417		27																
	418		30																
	419	23	46																
	420		47																
	421	23	25											-22					
	422		43																
	423		58													20			
	424		33																
	425		35																
	426		22				20												
	427		56								21								
	428		58													21			
T	429	-54													23				
	430	-26														-21	29		
	431	-29													-20		20		
	432	-62																	
	433			25									26						
	434	none																	
	435	-23											26				24		
	436												55				23		
	437												46				20		
	438												37						
	439																20		
D	440	-59					-26									-29			
	441	-48																	
	442	none																	
	443	-27					-21												
	444	-59														-32			
	445	-74														-30			
	446							-42								-29			
	447	-27					-21									-27			
	448	-63																	
	449	-58																	
	450	-70																	
	451	-36								-24									
	452	-47																	
	453	-61																	
C	454	-54																	
	455	-64																	
	456	-35																	

Source Factor	Item No.	Factor Number																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C	457	-48																	
	458	-36						-22								-23			
	459	-38																	
	460	-36																	
	461	-55													21				
	462	-37															27		
	463	-30															23		
	464	none																	
	465	-22						-25											
	466							-33		28									
	467	-23																	
	468	none																	
	469	-40																	
	470	-42														23			
	471	-48																	
	472	-49																	
	473	-33					20										20		
	474	-37																	
R	475		-20					-20								-64			
	476				-21		21									-32			
	477			28												-23			
	478		-32					-24								-76			
	479	36														-25	20		
	480	29																	
	481	35																	
	482	-41											23						
	483												23		27				
	484	none																	
	485		-24													-29			
	486															-31			
	487		-33																
	488				-20														
	489		-27											31					
	490	none																	
	491	none																	
O	492	33													28				
	493	none																	
	494	20													25				
	495	41																	
	496	30											-24						
	497	26																	
	498	32																	

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	1
O	499	none																	
	500							40											
	501	47						26											
	502	26																	
	503	28										54		34					
	504						24					24							
	505	28															-36		
	506	29															-33		
	507	none																	
Ag	508							25											
	509												-25						
	510						24							20					
	511								-22				-21						
	512	21																	
	513								-29										
	514							23					-21						
	515	none																	
	516							26											
	517						-35												
	518													22					
	519							23						21					
	520											20							
	521													20				-20	
	522	26												21					
	523													20					
Co	524								-36										
	525								-59										
	526								-59										
	527								-24										
	528												-26						
	529								-53										
	530								-27										
	531	none																	
	532						24												
	533													20					
	534								22										
	535								-34										
	536	none																	
	537	none																	
	538	none																	
	539				-20			21	-35							20			
	540								-43										

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Co	541								-31										
	542								-59										
	543								-31										
	544								-26										
	545								-29										
	546								-46										
	547						-29		-23										
	548								-20			31		25					
	549						25							24					
	550	22					21					28							
	551						32					21							
	552								-29										
	553						24		-26										
	554										-23								
	555						25		-27										
AA	556			66															
	557			50															
	558			58															
	559			50			-21												
	560			33															
	561			51															
	562			64															
	563			58															
	564			62															
	565			69															
	566			58															
	567			58															
	568			58															
	569			62															
	570			44															
	571			45		35													
	572			40															
	573			67															
	574			70															
	575			70															
CC	576				-43														
	577				-20		23												
	578				-23														
	579				-34		22												
	580	none																	
	581				-20														
	582				-52						-26								

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CC	583	none																
	584				-26				37									
	585				-48													
	586				-31				22									
	587				-51						-27							
	588				-21		-22											
	589	none																
	590				-32				22									
	591									25								
	592						20											
	593	none																
	594									27								
	595				-41													
	596				-30													
	597	none																
	598				-28		-23											
	599				-22													
	600				-21				20									

APPENDIX 4

ABBREVIATED FACTOR MATRIX, 12-FACTOR PROMAX ROTATION

Item numbers correspond to Appendix 2. Principal factor loadings are underlined; only loadings of 20 or higher are included. Decimal points are omitted.

Source Factor	Item No.	Factor Number											
		1	2	3	4	5	6	7	8	9	10	11	12
A	1		$\underline{29}$						-22				
	2		$\underline{23}$						-20				
	3		$\underline{38}$						-20		30		
	4	none											
	5		$\underline{30}$						-21				
	6		$\underline{37}$										
	7		$\underline{41}$								28		
	8		$\underline{39}$										
	9	none											
	10		$\underline{34}$										
	11		$\underline{35}$										
	12		$\underline{25}$										
	13		$\underline{29}$										
	14	-20	$\underline{32}$										
	15							$-\underline{21}$					
	16		26								21		
	17		$\underline{31}$	-28									
	18	none											
	19		$\underline{26}$										
	20		$\underline{33}$										
C	21								$\underline{24}$				
	22	$-\underline{24}$							23				
	23	-27					-31						
	24	-27					$-\underline{34}$						
	25	$-\underline{32}$											
	26				-22	-23							
	27							$\underline{21}$					
	28	$-\underline{43}$								-21			
	29								$\underline{20}$				
	30	$-\underline{21}$											
	31	-35											32
	32	$-\underline{21}$											
	33								$\underline{37}$	-26			
	34										$-\underline{22}$		
	35								$\underline{25}$				
	36			20					20				
	37	$-\underline{59}$											
	38	-32											
	39				$-\underline{38}$								
	40				$-\underline{26}$								

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12
D	41				22								
	42	30											
	43	28				28			-23				
	44	none											
	45				23	31			-23				
	46	none											
	47								-26				
	48	none											
	49								-27				
	50								-23				
	51	38											
	52	none											
	53					30							
	54	21											
	55	none											
	56	32							-24				
	57	27											
	58	26											
	59	none											
E	60						-35				24		
	61						-23						
	62			23	31								-23
	63	24											
	64				27								
	65		26										-22
	66	none											
	67	none											
	68	none											
	69									-20			
	70	none											
	71						-30						
	72					-29							
	73	none											
	74				42								
	75				56				21	-20			
	76				31				21				
	77								-21				
	78												-22
F	79				26					-33			
	80								24				
	81		39							-33		-21	
	82				22					-29			
	83		50										
	84		46										
	85		59							-20			
	86		22				-30						
	87	43		21									
	88	22		29									

Source Factor	Item No.	Factor Number											
		1	2	3	4	5	6	7	8	9	10	11	12
F	89		24		22					-60			
	90		64										
	91		37										
	92	25	31							-21			
	93	-23											
	94		26		30								
	95		34	24									
	96		20										
	97	-24	39									21	
G	98					21							
	99				-40								
	100				-24								
	101	none											
	102				-32								
	103				-27								
	104				-27								
	105				-28								
	106				-36								
	107				-36								
	108	none											
	109				-42								
	110				-45								
	111				-45								
	112				-29								
	113	-29											
	114	none											
	115				-34								
	116				-30					31			
H	117		44									27	
	118		35										
	119		62										
	120	-45	20									27	
	121	-27	36										
	122		41										
	123		53										
	124		47										
	125		24										-29
	126		47										
	127		29										
	128	-26											
	129				21								
	130	none											
	131		30										
	132		32										
	133		28					21					
	134		47										
	135		27		-25								

Source Factor	Item No.	Factor Number											
		1	2	3	4	5	6	7	8	9	10	11	12
I	136			25									
	137	none											
	138	29					-23				26		
	139	none											
	140		-20		-26			-22					
	141	20											
	142	none											
	143		22								28		
	144			23							22		
	145	none											
	146					-23							
	147		28	20							24		
	148			25									
	149		26										
	150				22								
	151	none											
	152						53						
	153				23								
	154	24											
J	155									20			
	156		-23							23	21		
	157					21		-43					
	158								-20				
	159	none											
	160								-23	22			
	161	none											
	162	23			-22								
	163		-39										
	164									20			
	165										28		
	166		-39										
	167		-34										
	168	21											
	169	none											
	170					-20							
	171	none											
	172	none											
L	173	none											
	174	none											
	175	28								25			
	176	26				20							
	177												-22
	178					25							
	179					25							-22
	180								-23				
	181								-21				
	182							-32					
	183							-26					

Source Factor	Item No.						Factor Number						
		1	2	3	4	5	6	7	8	9	10	11	12
L	184							-42					
	185							-37					
	186				21								
	187	21											
	188				-20								
M	189				21	28							-25
	190	none											
	191	none											
	192				26								
	193	31											
	194	44											
	195	none											
	196	20		22		-22							
	197	none											
	198		-26										
	199	20											
	200	none											
	201		-27	29									
	202				35								
	203	none											
	204	none											
N	205	none											
	206	-20								20	24		
	207				-30								
	208			23									
	209	none											
	210	none											
	211	none											
	212										31		
	213	none											
	214	22				23							
	215				-25					21			
	216	none											
	217	-46											
	218		20										
	219	none											
	220				23								
O′	221	41	-24										
	222	46											
	223	none											
	224	31				21							
	225	28							-26				
	226					29			-28	22			
	227	23											
	228	33							-20	29			
	229	35											
	230	33											
	231	22											

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12
O	232	47	20			-34							
	233	61											
	234	25							-23				
	235	40										-24	
	236	none											
Q_1	237	none											
	238	none											
	239					23					20		
	240							20					
	241				28								
	242				23								
	243			27									
	244			20									
	245	none											
	246							-21					
	247	none											
	248	-29											
	249	none											
	250	none											
	251	none											
	252	none											
Q_2	253		-27								20		
	254		-23										-20
	255	-26										20	-20
	256	-32											
	257	none											
	258	none											
	259	none											
	260	none											
	261		-43										
	262	-29											
	263		-28										
	264		-32								-23		
	265					24							
	266	none											
	267			33									
	268	none											
Q_3	269				-20					24			
	270	-23			-27								
	271	-22											
	272	none											
	273	none											
	274	-20			-30								
	275								34				
	276	-47											
	277							-23	20				
	278			33	-21								
	279	-35				-25							
	280	-30											

Source Factor	Item No.	Factor Number											
		1	2	3	4	5	6	7	8	9	10	11	12
Q_3	281	none											
	282	-35											
	283	none											
	284	none											
Q_4	285	43											
	286	34								22			
	287	33											
	288	29							-21				-21
	289	51											
	290	28											
	291					22							
	292	20								33			
	293	52											
	294	41											
	295	31											
	296	29							-20				
	297	26				22							
	298	46					24						
	299	45											
	300				-24								
G	301						-59				20		
	302						-51						
	303						24						
	304						-56						
	305				-22		-21						
	306						-39						
	307	-23											
	308						-39						
	309						-56						
	310						-37						
	311					31							
	312		25										
	313						-32						
	314						-26						
A	315		30										
	316		25										
	317		29								23		
	318												-39
	319	-26										22	
	320		22										-25
	321	none											
	322												-44
	323	-25											-38
	324	-23				25							-23
	325	-24											
	326		21		21								
	327	none											
	328		32										

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12
A	329		29										
	330		58										
	331	none											
	332		27										
	333		34										
	334	-24	22										
M	335				20				40				
	336									-21			-21
	337								38				
	338								28				
	339								39				
	340								48				
	341	-44				35							
	342	-41											
	343	-27											
	344	-49							22				
	345					21							
	346								25				
	347			-23		23							
	348					22			21				
	349					38							
	350										-35		
	351		-29	-37									
	352		-24										
	353					22							
	354		-35										
	355			-31									
	356								36				20
	357				32				26				
	358				31				44				
	359				24				46				
	360				63				34	-25			
	361				43				34				24
	362				27								
	363				20								
	364				33								
I	365	-43											
	366						-46						
	367						-23						
	368	-27										21	
	369						-25						
	370						-39				25		
	371					-29	-27						
	372	-22			-23								
	373	-27											
	374						-24						
	375								26				
	376	-28			-23								

Source Factor	Item No.						Factor Number						
		1	2	3	4	5	6	7	8	9	10	11	12
I	377	-49										27	
	378	-27											
	379	-35										22	
	380	none											
	381	-27				-25						48	
	382					-30						49	
	383				-22	-23							
	384					-20						21	
	385		22										
	386	-47										32	
	387	-28											28
	388	-41											
N	389	34											
	390	54											
	391	none											
	392	57											
	393	29											
	394	25											
	395	35											
	396	40											
	397	28							-25				
	398								-24				
	399	21							-28				
	400	28							-31				
	401	41											
	402	51							-22				
	403	21							-20				
	404	36											
	405	31											
	406	44					23				20		
	407	42					20						
S	408		29								-20		
	409		43									24	
	410		48										
	411		36				-30						
	412		59										
	413		47				-22						
	414	-49										27	
	415		29										
	416	-38	20										
	417		38										
	418		34										
	419		53										
	420		46									22	
T	421	-29	30									37	
	422	-21	41									33	
	423		55										
	424		37										

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12
T	425		32										
	426		21			24							
	427		58										
	428		55										
	429	51									21		
	430	25											
	431	32											
	432	59											
	433			27							23		
	434	none											
	435	27		22							21		
	436										57		
	437										51		
	438										39		
	439	none											
D	440	57								22			
	441	43											
	442	none											
	443	38											
	444	52											
	445	67								23			
	446	32							-20	27			
	447	38								28			
	448	56											
	449	50											
	450	61											
	451	38											
	452	52											
	453	59											
C	454	51											
	455	59											
	456	40								29			
	457	50											
	458	39								21			
	459	37											
	460	31											
	461	57											
	462	38											
	463	36								-22			
	464	none											
	465	27											
	466						-29		-26				
	467	none											
	468	none											
	469	45											
	470	42								-21			
	471	56											
	472	54								-26			

Source	Item						Factor Number						
Factor	No.	1	2	3	4	5	6	7	8	9	10	11	12
C	473	35											
	474	39								-29			
R	475									47			
	476				-20					30			
	477			31									
	478		-21							58			
	479	-29			-24					30			
	480				-20					20			
	481	-32								20			
	482	36									20		
	483							26		25	23		
	484				-27								
	485					-23							
	486									27			
	487		-30										
	488		-24		-20								
	489		-35										
	490	none											
	491	none											
O	492	-32											
	493	-20									-21		
	494	none											
	495	-37											
	496	-26									-24	22	
	497	-25											
	498	-25											
	499					-27							
	500								26				
	501	-48							27				
	502	-28											
	503	-33											38
	504	-35											24
	505	-36											-24
	506	-38			24								
	507	-21											
Ag	508					-22			22				22
	509					-25					-23		23
	510												20
	511							23			-20		
	512	none											
	513							27					
	514	none											
	515					-38							
	516	none											
	517					-47							
	518					-23							26
	519					-48		21					22
	520					-51							

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12
Ag	521				-21								22
	522	-28				-22							
	523	none											
Co	524							31					
	525							54					
	526							53					
	527	none											
	528	none											
	529							52					
	530							27					
	531	none											
	532							22					
	533												24
	534							21					
	535							35					
	536	none											
	537	none											
	538	none											
	539				-27			28		-21			
	540							42					
	541							33					
	542							49					
	543							34					
	544							26					
	545					-25		23					
	546							38					
	547					-26							
	548	-22				-21		23					26
	549												22
	550	-31											22
	551	-30											25
	552	-23						31					
	553	-20						24					
	554	none											
	555	-27						31					
AA	556			69									
	557			53									
	558			61									
	559			51		-22							
	560			35									
	561			50									
	562			66									
	563			57									
	564			62									
	565			69									
	566			58									
	567			61									
	568			58		23							
	569			65									

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11	12
AA	570			44		20							
	571			42									
	572			44									
	573			70									
	574			71									
	575			70									
CC	576				-40	-21							
	577				-25								
	578				-33								
	579				-29								
	580												22
	581				-23								
	582				-34			-20					
	583	none											
	584				-23			-34					
	585				-46				-23				
	586				-29			-24					
	587				-35								
	588				-20			-24			21		
	589				-22								
	590				-29			-22					
	591					21	-22						
	592				-21								
	593	none											
	594						-32						
	595				-35								
	596				-28								
	597				-20								
	598				-29			-26					
	599				-26			-22					
	600	none											

APPENDIX 5

ABBREVIATED FACTOR MATRIX, 11-FACTOR PROMAX ROTATION

Item numbers correspond to Appendix 2. Principal factor loadings are underlined; only loadings of 20 or higher are included. Decimal points are omitted.

Source Factor	Item No.	1	2	3	4	5	6	7	8	9	10	11
A	1				57							
	2				42							
	3				72							
	4				30	-27						
	5				55	-42						
	6				37	-24					22	
	7				64							
	8				58	-32						
	9						20					
	10		22			-31						
	11		36									
	12					-32						
	13		27			-20						
	14					-32						
	15	none										
	16				43							
	17					-47				-21		
	18	none										
	19				31						-21	
	20		40									
C	21	none										
	22	23										
	23	30						-44				
	24	28						-51				
	25	35										
	26			-26			-24					
	27	32										
	28	38						-20				
	29								44			
	30	29										
	31	58								24		
	32	39										
	33								35			
	34	24							20			
	35	none										
	36					21						
	37	56						-25				
	38	38						-27				
	39			-20								
	40	none										

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11
D	41								-33			
	42	-37							-21			
	43	-28							-37			
	44	none										
	45								-49			
	46	-23										
	47							34		63		
	48									23		
	49								-25	54		
	50									37		
	51	-35										
	52						-23					
	53	-30										
	54	-36										
	55	-24										
	56	-31								21		57
	57	-39										
	58	-20										
	59							-29				
E	60					20		-30				
	61	none										
	62	-24										
	63	-37										
	64			25								
	65		46									
	66						-26					
	67	none										
	68	none										
	69	none										
	70	none										
	71						-20	-28	-21			
	72	20										
	73	20										
	74			30								-20
	75			42				20			38	
	76		25									
	77	none										
	78	none										
F	79	-22		22				-34				
	80							-29				
	81		35					-26				
	82	-24		21				-30				
	83		36				21					
	84		32			-23						
	85		46			-25						
	86		25	-25				-30				
	87		40									
	88	none										

Source Factor	Item No.	1	2	3	4	5	6	7	8	9	10	11
		Factor Number										
F	89		26	22				-23	23			
	90		59									
	91		36			-23						
	92	-30	27									
	93	31										
	94		28									
	95				47							
	96				25							
	97	32	40									
G	98						37					
	99			-40								
	100			-31								
	101						35					
	102			-32								
	103			-27								
	104			-33								
	105			-40								
	106			-25								
	107			-27							-43	
	108						41					
	109			-36								
	110			-47								
	111			-28							-23	
	112			-27								
	113	40										
	114	none										
	115			-36								
	116			-27			22					
H	117	21	53									-21
	118		38									
	119		59									
	120	56	34									
	121	22	32									
	122		46									
	123		54									
	124		54									
	125		41			21						
	126	22	50									
	127		30							-28		-23
	128	37										
	129	20	27									
	130								24			
	131		33									
	132		35									
	133	20	34									
	134		39			-23						
	135	-21	28	-25								

Source Factor	Item No.	1	2	3	4	5	6	7	8	9	10	11
	136					34						
	137					22						
	138	-28				21						
	139	none										
	140		-22	-26								
	141										-50	
	142										-38	
	143				73							
	144				46	21						
	145				24						-22	
	146										-32	
	147				70							
	148				54							
	149				52						-21	
	150			36								
	151						27					
	152	-20						62		24		
	153										-27	
	154							34				
	155								-23			
	156		-26			22						
	157	-33										-25
	158								-29			
	159	-24										
	160								-40			
	161	-27				20						
	162	-30		-26								
	163		-40									
	164	none										
	165					39						
	166		-43					23				
	167					24						
	168		-29									
	169	none										
	170	none										
	171	none										
	172	none										
	173	none										
	174	none										
	175	-28							-26			
	176	-37							-27			
	177								-40			
	178	none										
	179							-24				
	180								-33			
	181								-35			21
	182	-30										
	183	none										

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11
L	184	none										
	185						-25					
	186	none										
	187	none										
	188			-29								
M	189								-35			
	190					20						
	191					24						
	192			21					-26			
	193	-40										
	194	-45										
	195	none										
	196										-34	
	197							26				
	198	none										
	199	-22										
	200	none										
	201				-23	57				24	-21	
	202			21							30	
	203	none										
	204	none										
N	205			-32		22						
	206	28				24						
	207			-25								
	208						-27					
	209										29	
	210	none										
	211	none										
	212				38							
	213	none										
	214	-30										
	215			-23								
	216		20					23		23		
	217	54										
	218				21							
	219						-29					
	220		-21									
O	221	-52	-27									
	222	-42										27
	223	none										
	224	-44										
	225	-23					24		-33			
	226								-45			
	227						-30					
	228	-21						37	-25			
	229	-40	22									
	230	-27										
	231	-24						29				
	232	-32										

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11
O	233	-60						29				
	234	-29										
	235	-55										
	236	none										
Q_1	237	21				28						
	238	none										
	239	-27		-30			22					
	240						20					
	241	none										
	242						-28					
	243					33						
	244					35						
	245										20	
	246	none										
	247	-20										
	248	34										
	249	none										
	250	none										
	251	none										
	252	none										
Q_2	253		-20			-30						
	254	none										
	255	31	32			24						
	256	33						-30				
	257					20						
	258	none										
	259	none										
	260	none										
	261		-47									
	262	29										-21
	263	-28	-31			22						
	264		-32									
	265						40					
	266						23					
	267			-24		29						
	268	none										
Q_3	269			-32								
	270			-38								
	271	26										
	272			-33								
	273						24					
	274			-36								
	275							-26	26	-58		
	276	49										
	277								25			
	278			-29		31						
	279	47							21			
	280	22										
	281	none										

Source Factor	Item No.						Factor Number					
		1	2	3	4	5	6	7	8	9	10	11
Q_3	282	49										
	283	none										
	284	22										
Q_4	285	-41		22								
	286	-30										
	287	-35										
	288	-38						23		24		
	289	-55										
	290	-20							-26			
	291								-40			
	292							21				
	293	-53										
	294	-42										
	295	-32								21		23
	296	-26								20		57
	297	-53										
	298	-54						23				
	299	-57										
	300			-20		-22						
G	301							-42				
	302			-28				-30				
	303							-20				
	304							-42		-20		
	305			-23				-27				
	306							-33				
	307	-34										
	308		21					-47				
	309	25						-49				
	310							-36				
	311							-20				
	312		21									
	313							-36				
	314	none										
A	315	25	35									
	316		30							-25		-21
	317		39									
	318		20				-20					
	319	35	28									
	320		38									
	321		27									
	322		23				-20					
	323		29									
	324		31						-21			
	325	23										
	326		23									
	327	none										
	328		32									
	329		31	-27				-20				

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11
A	330		$\underline{53}$									
	331			$\underline{-20}$								
	332		$\underline{32}$									
	333		$\underline{29}$									
	334	$\underline{30}$	22									
M	335					$\underline{21}$						
	336		22		-20			-30				
	337	none										
	338	none										
	339	none										
	340	$\underline{21}$										
	341	$\underline{31}$					23					
	342	$\underline{40}$										
	343	$\underline{31}$										
	344	$\underline{43}$										
	345				$\underline{-28}$							
	346				$\underline{-38}$			-20				
	347				$\underline{-42}$							
	348				-27		20					
	349						27					
	350				-21	$\underline{-30}$						
	351		-22		-27							
	352	none										
	353				$\underline{-24}$							
	354	none										
	355				-33	-21					30	
	356	none										
	357			$\underline{29}$								
	358			24					26			
	359	none										
	360			$\underline{43}$							34	
	361			$\underline{28}$								
	362	$\underline{21}$										
	363	none										
	364			$\underline{24}$								
I	365	$\underline{48}$	21									
	366							$\underline{-45}$				
	367			-23				-26				
	368	$\underline{34}$										
	369							$\underline{-25}$				
	370					21		$\underline{-35}$				
	371	29		-20			-32	-29				
	372	none										
	373	29	21									
	374							-22				
	375							$\underline{-29}$				
	376			-20				-29				

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11
I	377	56	22									
	378	23						-31				
	379	26	22					-21				
	380	none										
	381	48										
	382	39										
	383	29										
	384	29										
	385		26					-26				
	386	58										
	387	45										21
	388	50										
N	289	-22										
	390	-49						21				
	391	-27										
	392	-46										
	393	-29										
	394	-34										
	395	-29										
	396	-38										
	397	-43										
	398	-20										
	399	-25								32		
	400	-21								33		
	401	-37						23				
	402	-45							-23			
	403	-29								21		
	404	-36										
	405	-37						20				
	406	-44						27				
	407	-50						28				
S	408		31									
	409		44									
	410		52									
	411		36					-23				
	412		52									
	413		47									
	414	53	25									-20
	415		27									
	416	43	20									
	417	20	37									
	418		27									
	419	22	48									
	420		50									-20
	421	37	36									
	422	33	45									
	423		47									
	424		33				20					

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11
S	425		25									
	426					-20	21					
	427		42									
	428		44									
T	429	-46										
	430	-29					20					
	431	-29										
	432	-55										
	433					40						
	434	none										
	435	-20		-22		35						
	436	-20				28						
	437					22						
	438	-21		-20								
	439						23					
D	440	-46						24				
	441	-51										
	442	21										
	443	-34										
	444	-56										
	445	-61						30				
	446							27	-28			
	447	-20						25				
	448	-60										
	449	-52	-28									
	450	-62						31				
	451	-31						35				
	452	-52										
	453	-59										
C	454	-55										
	455	-56										
	456							20				
	457	-44						23				20
	458	-24						25				
	459	-33	25									
	460	-37										
	461	-54										
	462	-39										
	463	-36										
	464	none										
	465	-27							-24			
	466							-21	-29			
	467	-24										
	468	none										
	469	-44		25								
	470	-40		21								
	471	-48		20								
	472	-43		21								

Source Factor	Item No.	1	2	3	4	5	6	7	8	9	10	11
C	473	-34					23					
	474	-37		24								
R	475			-26								
	476						22					
	477					22						
	478		-23	-22								
	479	39		-34								
	480	28										
	481	44										
	482	-43										
	483					21						26
	485	-30	-20	-30				22				
	486		-21	-25								
	487	-31										
	488	-25										
	489		-48									
	490			-22								
	491	none										
O	492	31										
	493	27										
	494	none										
	495	45										
	496	38										
	497	33										
	498	41	20									
	499	33										
	500								28			
	501	40							22			
	502	40										
	503	46								20		
	504	38										
	505	31										
	506	34										
	507	20										
Ag	508	20							23			
	509	none										
	510						25					
	511	20										
	512	32										
	513	none										
	514	none										
	515	33										
	516	24							21			
	517	23					-32					
	518	26										
	519	30							22			
	520	27							20			
	521		-23					22				

Source Factor	Item No.	1	2	3	4	5	6	7	8	9	10	11
		Factor Number										
Ag	522	38	-25									
	523	none										
Co	524	24										
	525	33										
	526	27										
	527	none										
	528	24										
	529	none										
	530	23										
	531	none										
	532						24					
	533	31										
	534	20										
	535	23										
	536	none										
	537	none										
	538	none										
	539								22			
	540	none										
	541	none										
	542	none										
	543	32					21					
	544	29					20					
	545	34										
	546	22										
	547						-24					
	548	43										
	549	29					29					
	550	41										
	551	38					28					
	552	35										
	553	29					23					
	554						22					
	555	34					21					
AA	556				25	31						
	557					27						
	558				26	29						
	559					23	-22					
	560			-25		21						
	561			-29		27						
	562				22	30						
	563			-26		26						
	564			-20		30						
	565				27	37						
	566			-22		35						
	567			-22	22	30						
	568				21	31						
	569			-23		31						

Source Factor	Item No.	Factor Number 1	2	3	4	5	6	7	8	9	10	11
AA	570	none										
	571			-28	-20	29						
	572			-20		27						
	573			-26		37						
	574			-23		37						
	575					40						
CC	576			-22								
	577			-20			22					
	578			-29								
	579			-23			20					
	580	none										
	581	none										
	582			-24							-26	
	583					-26						
	584	-21										
	585	-20		-40								
	586			-23								
	587			-24								
	588						-26					
	589	none										
	590			-25		-20						
	591			-21				-35				
	592			-21				-20				
	593	none										
	594							-26				
	595			-22								
	596	none										
	597				-21	-20						
	598			-28			-21					
	599			-22								
	600	-25										

APPENDIX 6

I. INTERCORRELATIONS AMONG 18 PROMAX FACTORS (TOTAL MATRIX)*

	FACTOR NO.																
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	34	02	08	-04	20	49	-59	08	-06	18	-09	13	13	-57	-24	37	-03
2		16	-01	29	19	22	-26	38	00	08	-15	-33	-04	-20	09	18	-25
3			-13	28	-07	18	00	23	-04	-06	39	-17	-06	-13	19	-01	07
4				08	-02	-18	-10	-08	-56	03	15	04	09	-12	-42	12	27
5					-02	-10	-06	00	-11	01	13	-05	-05	-05	01	-20	-01
6						11	-21	17	10	10	-19	-12	-16	02	10	11	-07
7							-28	16	-04	25	-11	-09	08	-48	-01	33	08
8								04	21	-20	05	-24	-17	46	29	-18	13
9									16	03	05	-52	-19	10	16	19	-08
10										02	-32	-15	-35	35	43	-27	-07
11											-26	-30	-25	-11	-03	-09	06
12												15	26	-05	-23	19	04
13													37	-28	-24	07	-02
14														-42	-24	35	14
15															24	-30	-25
16																-23	-09
17																	-13

*decimal points omitted
correlation coefficients of .30 or higher underlined

II. INTERCORRELATIONS AMONG 12 PROMAX FACTORS (GUILFORD MATRIX)*

	FACTOR NO.										
	2	3	4	5	6	7	8	9	10	11	12
1	-26	02	10	10	-01	-53	-46	-31	10	-30	-29
2		29	-29	26	-41	17	25	-04	-05	32	-10
3			-19	-06	-18	-01	06	09	42	14	-09
4				-29	27	-01	-41	09	08	-15	-15
5					-34	-02	10	-40	01	39	19
6						08	-14	25	01	-18	29
7							34	29	-02	27	34
8								21	-10	28	14
9									-16	-08	18
10										17	-11
11											19

*decimal points omitted
correlation coefficients of .30 or higher underlined

III. INTERCORRELATIONS AMONG 11 PROMAX FACTORS (CATTELL MATRIX)*

	FACTOR NO.									
	2	3	4	5	6	7	8	9	10	11
1	17	-15	00	03	36	31	19	-50	09	19
2		-03	28	-02	04	-27	10	-09	22	-16
3			-04	-02	-11	-09	-25	14	13	-07
4				20	-08	10	-19	-15	06	09
5					-10	11	-21	-30	14	-08
6						-01	17	-11	-07	20
7							-28	-48	-29	48
8								10	-14	-20
9									03	-36
10										-34

*decimal points omitted
correlation coefficients of .30 or higher underlined

APPENDIX 7

Cluster correlation coefficients estimating loadings of source factors on empirical Varimax factors for Guilford and Cattell Matrices. (Decimal points omitted)

I. Guilford Varimax Factors

	Source Factors	1	2	3	4	5	6	7	8	9	10	11	12	h
	G	-06	25	01	-08	12	-73	-06	01	-03	-06	-01	-01	6
	A	-33	64	20	-05	06	-26	-01	10	03	05	14	-26	7
G	M	-47	-07	-29	20	17	-10	10	52	-06	-14	01	-02	7
U	I	-65	29	07	-11	01	-37	09	03	-08	04	32	-03	7
I	N	82	-06	-05	00	06	11	-13	-22	-06	02	06	-12	7
L	S	-36	82	11	00	00	-15	01	00	-02	-03	10	-03	8
F	T	30	11	40	-09	18	-22	-03	11	07	44	21	12	6
O	D	83	-17	03	03	-06	09	-17	-04	22	-01	00	-01	8
R	C	85	02	-03	04	16	-02	-16	-11	-12	01	10	04	8
D	R	-23	-42	17	-20	-14	12	16	-01	42	12	04	08	5
	O	-73	01	-08	15	-11	15	26	09	-03	-05	06	-01	6
	Ag	-47	-09	02	-16	-35	21	38	18	11	-07	05	29	7
	Co	-47	-02	00	07	-04	09	72	-01	00	-02	04	20	8
	AA	-02	09	95	-08	00	-07	02	02	01	01	-01	-02	9
	CC	04	09	02	-69	06	-13	-32	-05	-05	-09	-06	04	6
	A	00	53	13	04	-10	10	02	-24	01	12	-06	10	40
	C	-70	08	01	-20	-03	-09	14	18	-14	-05	05	15	64
	D	61	-01	-10	17	19	-01	-17	-31	-01	-05	-01	-14	60
	E	06	33	13	41	06	-31	-11	02	-12	08	10	-22	49
C	F	-10	75	04	15	12	-21	-07	03	-25	-03	-07	02	73
A	G	-29	00	20	-63	06	-03	10	05	21	10	02	13	62
T	H	-36	74	12	05	-08	-13	09	09	-03	04	12	-10	76
T	I	22	06	46	-01	-11	19	08	-10	12	28	07	13	43
E	J	26	-37	17	-01	00	01	-17	-08	29	08	06	-05	37
L	L	43	-01	-05	17	13	-08	-37	-24	06	-01	-06	-15	46
L	M	44	-16	20	18	-01	00	-03	-03	-04	04	10	-15	32
	N	-08	11	20	05	03	-07	-01	-13	02	16	-01	-11	12
	O	78	-12	00	-01	-01	12	-08	-21	15	-03	-06	00	71
	Q1	-09	07	31	14	02	-17	02	08	03	24	02	08	23
	Q2	-24	-24	18	07	10	-01	09	10	09	27	15	-06	28
	Q3	-61	04	17	-31	-07	-14	04	17	05	11	01	01	57
	Q4	79	-04	-08	-01	18	11	-17	-17	04	-03	03	-01	74

II. Cattell Varimax Factors

Source Factors		1	2	3	4	5	6	7	8	9	10	11	h^2
	G	-05	36	-18	-05	05	-08	-49	-06	-13	01	01	44
	A	21	72	-23	09	15	-03	-13	-03	-05	01	-16	71
G	M	45	08	20	-42	-02	15	-17	13	-14	19	-08	55
U	I	56	41	-27	-03	08	01	-34	05	01	-01	-10	69
I	N	-76	-15	15	08	-03	-07	16	-16	16	-03	09	73
L	S	27	81	-13	16	-06	02	-10	00	-01	01	-09	79
F	T	-33	13	-24	22	41	20	-13	02	-02	-07	-04	47
O	D	-74	-27	07	06	06	-10	26	-13	-01	-06	04	73
R	C	-81	-06	21	05	-03	00	00	-15	12	-06	03	74
D	R	30	-45	-38	04	20	07	21	-02	-07	01	13	54
	O	78	08	09	-06	-03	05	06	12	-04	09	-01	66
	Ag	63	-10	-14	00	-05	11	27	29	-11	-13	19	66
	Co	68	01	06	03	03	26	10	05	-07	-03	26	62
	AA	-05	18	-36	31	49	-04	-01	14	00	-17	00	55
	CC	-25	07	-56	-09	-30	-01	-17	09	05	-10	-04	53
	A	03	35	-02	74	-25	01	05	09	-08	03	03	75
	C	66	16	-20	-07	-10	07	-26	32	06	00	02	69
	D	-61	-04	22	03	-03	-07	02	-45	24	03	09	70
	E	-12	45	25	10	29	-17	-16	-10	-02	18	-18	50
C	F	00	75	12	18	-12	01	-29	06	03	10	-03	72
A	G	20	-01	-72	-01	-02	28	00	11	-06	-16	06	69
T	H	31	82	-05	12	06	-01	-01	06	-03	-03	-08	80
T	I	-13	-07	-05	61	26	12	16	03	06	-38	02	65
E	J	-26	-37	-15	-03	27	-06	14	-16	02	-01	-04	35
L	L	-50	-03	11	-01	-01	-18	-06	-43	07	05	11	50
L	M	-37	-11	19	-01	35	-14	10	-09	08	-20	00	39
	N	05	12	-13	23	20	-04	-06	-10	13	16	-04	19
	O	-70	-23	06	07	-02	-05	25	-28	02	-09	16	73
	Q_1	04	14	-10	14	44	-02	-09	02	-04	22	-10	32
	Q_2	25	-19	-07	-02	42	22	-07	-01	-02	02	-13	36
	Q_3	51	10	-48	-03	09	05	-14	25	-09	03	-11	61
	Q_4	-79	-13	11	04	-09	05	13	-21	17	-01	13	77

III. Supplementary Guilford Varimax Factors

Source Factors		1	2	3	4	5	6	7	8	h^2	h^2T*
GUILFORD	G	-06	-02	-47	-03	00	-01	-01	07	23	67
	A	-02	00	04	-08	-03	10	08	06	03	73
	M	-02	03	-02	-05	-02	37	-17	07	18	73
	I	-06	01	-08	-31	04	-01	01	03	11	79
	N	-03	-01	-07	-07	08	04	14	-08	05	77
	S	03	-05	-03	-11	00	02	-01	-05	02	81
	T	-01	03	05	-01	36	-01	-04	-05	14	61
	D	-02	-01	-07	06	13	10	-12	-10	06	79
	C	01	05	-04	00	25	02	03	-07	07	82
	R	-02	-02	05	-05	-02	00	-11	02	02	56
	O	03	-02	02	-06	09	01	02	04	02	68
	Ag	00	05	-05	00	06	00	-10	-08	03	69
	Co	05	43	-03	-05	03	-09	-01	-06	20	82
	AA	61	01	04	03	00	-02	-01	02	37	92
	CC	02	-18	-01	04	01	09	16	-03	07	60
CATTELL	A	-03	-01	05	-01	00	00	03	03	01	76
	C	03	01	03	-01	01	06	-04	01	01	69
	D	01	-01	-02	-02	-05	04	02	04	01	71
	E	01	03	-04	-06	04	-03	-02	03	01	51
	F	06	-03	-03	05	02	-01	-01	-05	01	73
	G	-01	-01	-02	03	-01	02	06	-02	01	69
	H	-05	-02	03	-02	00	02	01	-05	01	80
	I	03	-03	00	00	00	-01	00	02	00	65
	J	02	-11	-01	00	03	-03	-07	06	02	37
	L	03	-16	05	03	-01	-02	-02	01	03	53
	M	06	03	03	-05	02	-02	05	00	01	40
	N	00	02	07	00	-01	03	05	-02	01	20
	O	01	02	-01	00	00	-03	-03	-08	01	74
	Q_1	03	05	11	03	04	-03	-05	-02	02	34
	Q_2	-02	-07	00	-07	-02	01	07	01	02	37
	Q_3	-02	00	02	03	-01	-01	03	01	00	62
	Q_4	-04	00	-01	-04	04	05	-03	02	01	78

*Communality over both Cattell and Supplementary Guilford factors.

IV. Supplementary Cattell Varimax Factors

Source Factors		1	2	3	4	5	6	7	h^2	h^2T*
GUILFORD	G	07	-02	03	-02	02	08	04	01	65
	A	01	04	-03	01	-02	-01	01	00	74
	M	-09	08	-05	06	-02	02	-04	02	72
	I	-01	-01	00	00	01	03	-02	00	79
	N	00	-03	00	06	-01	08	-03	01	79
	S	-02	-01	00	-01	00	-01	-02	00	84
	T	-03	03	-01	02	-04	-07	-04	01	63
	D	-01	-02	-03	-02	-05	02	00	00	81
	C	-01	04	-02	-02	02	-02	01	00	82
	R	-02	-01	-03	07	-04	00	-08	01	56
	O	00	-03	-04	00	02	05	-03	01	69
	Ag	00	-01	-02	-01	00	01	02	00	70
	Co	00	-02	-01	-01	-05	-02	-01	00	81
	AA	-04	01	-01	00	00	01	01	00	92
	CC	00	10	00	01	-02	04	-02	01	64
CATTELL	A	51	05	02	00	02	02	-30	35	76
	C	06	-08	-07	05	02	-11	03	03	67
	D	00	19	00	22	07	07	03	10	70
	E	00	-01	13	-04	07	01	-01	02	51
	F	04	-09	-02	04	05	-01	-03	02	75
	G	-01	02	05	04	-21	12	02	07	68
	H	-01	03	-04	01	06	-06	05	01	77
	I	37	04	21	00	05	04	14	21	64
	J	-08	07	-02	01	-03	-04	03	02	38
	L	-04	22	01	06	04	00	00	05	52
	M	-08	08	12	00	06	-03	16	06	38
	N	08	04	-17	08	-02	-09	-05	05	18
	O	-04	12	04	04	-01	01	-02	02	73
	Q_1	-03	03	-24	-01	-07	-12	01	08	31
	Q_2	-04	03	-04	-08	-05	13	12	04	33
	Q_3	-03	-08	-01	-05	-18	-02	-02	04	61
	Q_4	02	03	00	17	01	02	-01	03	77

*Communality over both Guilford and Supplementary Cattell factors.

APPENDIX 8

Percentages of Elements Lying Within the Hyperplane (± .10) for Each Factor Matrix

Matrix Analyzed	Unrotated Factor Matrices	Varimax Factor Matrices	Promax Factor Matrices
Total Matrix-600 items, 18 factors	74.61%	78.10	79.47
Guilford Matrix-300 G items + 300 C items, 12 factors	67.72	70.65	79.26
Cattell Matrix-300 C items + 300 G items, 11 factors	65.62	69.18	76.12
Guilford Residual Matrix-300 G items + 300 C items, 8 factors	91.04	92.40	93.12
Cattell Residual Matrix-300 C items + 300 G items, 7 factors	92.81	94.38	94.29